Cisco AS5800 Universal Access Server Hardware Installation Guide

Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

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About This Guide

This section discusses document objectives, targeted audience, document organization, document conventions, terms and acronyms, and additional documentation available.

Document Objectives

This document describes the initial site preparation, hardware installation, and troubleshooting of the Cisco AS5800 universal access server (Cisco AS5800), which consists of the Cisco 5814 dial shelf and the Cisco 7206 router shelf. Also included is information describing the hardware components, including dial shelf cards, dial shelf controller cards, blower assembly, maintenance monitors, power supplies, and cables.

Audience

This publication is designed for the system technician who is responsible for installing the Cisco AS5800. The system technician should be familiar with electronic circuitry and wiring practices and have experience as an electronic or electromechanical technician. It is assumed that the system technician has experience with the installation of high-end networking equipment.

This publication does not include software configuration instructions for the Cisco AS5800. For software configuration, refer to the *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* that shipped with your access server. The *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* will be replaced by the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide*, available later this year.

This publication does not address the specific dial shelf cards for the Cisco AS5800. For specific information about the dial shelf cards, refer to the *Cisco AS5800 Universal Access Server Dial Shelf Card Guide* that shipped with your access server.

For a complete description of Cisco IOS software, refer to the Cisco IOS configuration guides and command references and to the documents listed in the section “Related Documentation” in this chapter.

Document Organization

The *Cisco AS5800 Universal Access Server Hardware Installation Guide* is organized as follows:

- Chapter 1, “Cisco AS5800 Product Overview,” provides an overview of the access server, describes its features, and lists its physical specifications.
- Chapter 2, “Preparing for Installation,” includes safety recommendations, site preparation instructions, and instructions for preparing the Cisco 5814 dial shelf for rack mounting.
- Chapter 3, “Installing the Cisco AS5800,” includes step-by-step instructions for rack-mounting the access server in a standard 19-in. 4-post rack and standard telco rack.
- Chapter 4, “Powering On the Cisco AS5800 and Observing Initial Startup Conditions,” explains how to power on the access server, check normal LED operation, and check that the proper software is loaded on the router shelf and dial shelf.
- Chapter 5, “Hardware Troubleshooting,” discusses troubleshooting strategies for the access server and provides basic troubleshooting tips.
- Appendix A, “Cisco AS5800 Specifications,” provides specification tables and describes the cables used between Cisco AS5800 components.
- Appendix B, “Industry-Standard Wiring Plans,” describes standard color coding for system wiring.
- Appendix C, “Cisco 5814 Dial Shelf Packaging Replacement Instructions,” explains how to prepare the dial shelf for repackaging and how to package the dial shelf for shipping.

Document Conventions

This publication uses several formatting conventions to convey instructions and information.

Screen displays use the following convention:

- The caret symbol represents the control key. For example, the key combination **^D** in a screen display means that you hold down the **Control** key while you press the **D** key.

Command descriptions use these conventions:

- Commands and keywords are in **boldface** font.
- Variables for which you supply values are in *italic* font.
- Elements in square brackets ([ ]) are optional.
- Alternative but required keywords are grouped in braces ({ }) and are separated by a vertical bar (|).

Examples use these conventions:

- Terminal sessions are in `screen` font.
- Information you enter is in **`boldface screen`** font.
- Nonprinting characters are shown in angle brackets (< >).
- Information displayed on the screen is in `screen` font, with default responses in square brackets ([ ]).

Note Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

Caution Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Timesaver Means *the action described saves time*. You can save time by performing the action described in the paragraph.

Tips Means *the following information might help you solve a problem*.

Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, might harm you. A warning symbol precedes each warning statement. To see translations of safety warnings pertaining to the Cisco AS5800, refer to the *Regulatory Compliance and Safety Information* document that shipped with your system.

Warning This warning symbol means *danger.* You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Waarschuwing Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.

Varoitus Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).

Attention Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions d’avertissements figurant dans cette publication, consultez le document *Regulatory Compliance and Safety Information* (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil.

Warnung Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.

Avvertenza Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento *Regulatory Compliance and Safety Information* (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.

Advarsel Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *Regulatory Compliance and Safety Information* (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.

Aviso Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. Para ver as traduções dos avisos que constam desta publicação, consulte o documento *Regulatory Compliance and Safety Information* (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.

¡Advertencia! Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado *Regulatory Compliance and Safety Information* (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.

Varning! Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förkommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.

Terms and Acronyms

The following acronyms, initialisms, and terms identify the Cisco AS5800 system components and features:

- Dial shelf controller (DSC) card—A printed circuit board that connects to the dial shelf backplane and serves as the interface between the dial shelf and the router shelf. The dial shelf controller card also supports environmental monitoring and board initialization at power-up.
- CPU core—Common CPU circuitry shared by all cards within the dial shelf.
- Dial shelf—A chassis containing modem cards, trunk cards, and dial shelf controller cards. The dial shelf provides digital and analog call termination functionality.
- Dial shelf card—A trunk card, modem card, or VoIP card.
- Dial shelf interconnect—A 100-Mbps full-duplex, nonblocking connection between the router shelf and the dial shelf, which is used to pass packets between the dial shelf and the router shelf. This connection includes a dial shelf interconnect port adapter and a Cisco proprietary interconnect cable, which is used to connect the interconnect port adapter in the router shelf to the dial shelf controller card.

- Double-density modem module (DMM)—Each double-density modem card contains 12 DMM SIMMS. Each DMM SIMM contains 12 digital modems.The Cisco AS5800 has the capability of terminating up to 1,344 modem connections when equipped with 10 double-density modem cards and 2 CT3 trunk cards.
- Egress interface—The router shelf interface to a network, such as the Internet or a corporate intranet or backbone. Supported interfaces include Fast Ethernet, HSSI, FDDI, and ATM interfaces.
- Front and rear—The *front* of the dial shelf is defined as the card-insertion side and provides access to the line cards and the blower assembly. The *rear* or back of the dial shelf is defined as the power-entry side and provides access to the filter module and two power-entry modules.
- I/O controller card—The router shelf card containing the system I/O controller.
- Ingress interface—Dial shelf cards that connect to the telco network and contain the necessary functionality to terminate a telco connection. The ingress interface terminates digital calls at the dial shelf. The Cisco AS5800 currently supports CE1, CT1 and CT3 ingress interfaces.
- Maintenance bus (MBus)—Used in the dial shelf to monitor –48 VDC from both DC power supplies using analog isolation circuits.
- Modem card—A printed circuit board that connects to the dial shelf backplane and contains hex modem module SIMMs. Its primary purpose is conversion between pulse code modulation (PCM)-encoded analog bitstreams on the backplane TDM bus and packetized digital data on the backplane interconnect. The modem card terminates incoming analog calls at the dial shelf.
- Network processor card—The router shelf card containing the network processing engine (NPE).
- Online insertion and removal (OIR)—A feature that allows you to insert and remove modules and cards without interruption to service while the system is powered on.
- Pulse code modulation (PCM)—A specific way of representing an analog waveform in digital format.
- Power-entry module (PEM)—A –48 VDC power supply module.
- Router shelf—The host route processing functionality for the dial shelf. The router shelf carries data between the dial shelf and an external network, such as the Internet. Full Cisco IOS software functionality is provided on the router shelf.
- Time-division multiplexing bus (TDM bus)—A dial shelf proprietary serial telecommunications backplane that enables multiple channels of data to be transmitted over the same medium. The TDM bus connects a DS0 channel (from the ingress interface) to an individual modem on the modem card.
- Trunk card—A printed circuit board that connects to the dial shelf backplane and contains trunk circuitry, such as CT1 or CE1 interfaces. The trunk card acts as the ingress interface through which all calls are received, and terminates incoming digital calls at the dial shelf.

Related Documentation

The Cisco IOS software running your Cisco AS5800 includes extensive features and functionality. For information regarding the Cisco AS5800 that is beyond the scope of this document or for additional information, use the following resources:

Timesaver Make sure that you have access to the documents listed in Table 1. These documents are available in print, on CD-ROM, and on the World Wide Web. If you need further assistance, see the section “Cisco Connection Online.”

Table 1 Related and Referenced Documents

Cisco Product	Document Title
Cisco AS5800	• *Read Me First* • *Cisco AS5800 Universal Access Server Hardware Installation Guide* (this book*)* • *Cisco AS5800 Universal Access Server Dial Shelf Card Guide* • *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* (to be replaced later this year by the *Cisco AS5800 Universal Access Server Operations, Administration, Maintenance, and Provisioning Guide*) • *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information*
Cisco 7206 router shelf	• *Cisco 7206 Installation and Configuration Guide* • *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines* • *Regulatory Compliance and Safety Information for the Cisco 7200 Series Routers* • Configuration notes, updates, and release notes
Cisco 5814 dial shelf	• Configuration notes, updates, and release notes
System controller	• *Read Me First* • *Cisco 3640 System Controller Installation and Configuration Guide* • *Cisco 3640 Router Installation and Configuration Guide* • Configuration notes, updates, and release notes
Network management system	• Configuration notes, updates, and release notes
Cisco IOS software[1]	• *Configuration Fundamentals Configuration Guide* • *Configuration Fundamentals Command Reference* • *Dial Solutions Configuration Guide* • *Wide-Area Networking Configuration Guide* • *Wide-Area Networking Command Reference* • *Network Protocols Configuration Guide* • *Network Protocols Command Reference* • *Configuration Builder Getting Started Guide* • *Troubleshooting Internetworking Systems* • *Debug Command Reference* • *System Error Messages* • *Cisco IOS Software Command Summary* • *Cisco Management Information Base (MIB) User Quick Reference*

1 Refer to the modular reference publications that correspond to the Cisco IOS software release installed on your access server.

If You Need More Information

For information regarding the Cisco AS5800 that is beyond the scope of this document or for additional information, use the following resources:

- For Cisco AS5800 software configuration, refer to the *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* that shipped with your system. The *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* will be replaced by the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide,* available later this year.
- For information about the trunk cards, modem cards, and Voice over IP cards used in the Cisco 5814 dial shelf, refer to the *Cisco AS5800 Universal Access Server Dial Shelf Card Guide* that shipped with your system.
- For international agency compliance, safety, and statutory information for wide-area network (WAN) interfaces for the Cisco AS5800, refer to *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information* that shipped with your system.
- To obtain general information about documentation, refer to the section "Cisco Connection Online," or call customer service at 800 553-6387 or 408 526-7208. Customer service hours are 5:00 a.m. to 6:00 p.m., Pacific time, Monday through Friday (excluding Cisco–observed holidays). You can also send e-mail to cs-rep@cisco.com, or you can refer to the *Cisco Information Packet* that shipped with your system.
- Cisco Documentation CD-ROM package

  Cisco documentation and additional literature are available in a CD-ROM package that ships with your product. The Documentation CD-ROM, a member of the Cisco Connection Family, is updated monthly; therefore, it might be more current than printed documentation. To order additional copies of the Documentation CD-ROM, contact your local sales representative or call customer service. The CD-ROM package is available as a single package or as an annual subscription. You can also access Cisco documentation on the World Wide Web at http://www.cisco.com, http://www-china.cisco.com, or http://www-europe.cisco.com.

  If you are reading Cisco product documentation on the World Wide Web, you can submit comments electronically. Click **Feedback** on the toolbar, and then select **Documentation**. After you complete the form, click **Submit** to send it to Cisco. We appreciate your comments.
- For additional Cisco IOS software information, refer to the following modular configuration and modular command reference publications, as appropriate for your configuration:
  - *Configuration Fundamentals Configuration Guide*
  - *Configuration Fundamentals Command Reference*
  - *Dial Solutions Configuration Guide*
  - *Wide-Area Networking Configuration Guide*
  - *Wide-Area Networking Command Reference*
  - *Network Protocols Configuration Guide*
  - *Network Protocols Command Reference*
  - *Configuration Builder Getting Started Guide*
  - *Troubleshooting Internetworking Systems*
  - *Debug Command Reference*
  - *System Error Messages*

— *Cisco IOS Software Command Summary*

— *Cisco Management Information Base (MIB) User Quick Reference*

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CCO serves a wide variety of users through two interfaces that are updated and enhanced simultaneously—a character-based version and a multimedia version that resides on the World Wide Web (WWW). The character-based CCO supports Zmodem, Kermit, Xmodem, FTP, and Internet e-mail, and is excellent for quick access to information over lower bandwidths. The WWW version of CCO provides richly formatted documents with photographs, figures, graphics, and video, as well as hyperlinks to related information.

You can access CCO in the following ways:

- WWW: http://www.cisco.com
- WWW: http://www-europe.cisco.com
- WWW: http://www-china.cisco.com
- Telnet: cco.cisco.com
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

Note If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or cs-rep@cisco.com.

CHAPTER 1

Cisco AS5800 Product Overview

The Cisco AS5800 is a high-density, ISDN and modem WAN aggregation system that provides both digital and analog call termination. It is intended to be used in service provider dial point-of-presence (POP) or centralized enterprise dial environments.

The access server components include a Cisco 5814 dial shelf and a Cisco 7206 router shelf. Two versions of an optional AC power shelf is also available, either standard or enhanced. Dial shelf cards communicate with the host router shelf over a dial shelf interconnect cable. This nonblocking interconnect cable supports 100-Mbps, full-duplex data transfer.

The access server is designed with environmental monitoring and reporting functions to help maintain normal system operation and resolve adverse environmental conditions prior to loss of operation. If conditions reach critical thresholds, the system shuts down to avoid equipment damage from excessive heat or electrical current.

Downloadable software and microcode allow you to load new software images into Flash memory remotely, without having to physically access the router shelf, for fast and reliable upgrades.

This chapter provides physical and functional overviews to familiarize you with your new Cisco AS5800. It contains physical descriptions of system hardware and major components and functional descriptions of component features.

Note Descriptions and examples of software commands appear in this document only when they are necessary for installing the system hardware. For software configuration information, refer to the *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* that shipped with your system. The *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* will be replaced by the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide*, available later this year.

System Components

The following sections in this chapter describe the core system components:

- Cisco 5814 Dial Shelf, page 1-8
- Dial Shelf Backplane, page 1-13
- Dial Shelf Field-Replaceable Units
  - Dial Shelf Controller Card, page 1-17
  - Dial Shelf Filter Module, page 1-27
  - Cisco 7206 Router Shelf, page 1-32
  - DC-Input Power Specifications, page 1-41
- Power Requirements, page 1-39

The Cisco AS5800 is designed to be rack-mounted. A rack-mount kit is included with each Cisco 5814 dial shelf and each Cisco 7206 router shelf. Each rack-mount kit provides the hardware needed to mount the dial shelf and router shelf in a standard, 19-in. equipment rack or standard telco rack. If you plan to use a 23-in. equipment rack, you must provide your own brackets or shelves to accommodate the Cisco 7206 router shelf and optional AC power supply. For clearance requirements and rack-mount installation considerations, refer to the section “Site Specifications” in the chapter “Preparing for Installation.”

Figure 1-1 shows a front view of a Cisco AS5800, and Figure 1-2 shows a rear view.

Figure 1-3 shows a front view of a Cisco AS5800 with the enhanced power supply, and Figure 1-4 shows a rear view of a Cisco AS5800 with the enhanced power supply.

Figure 1-1 Cisco AS5800—Front View

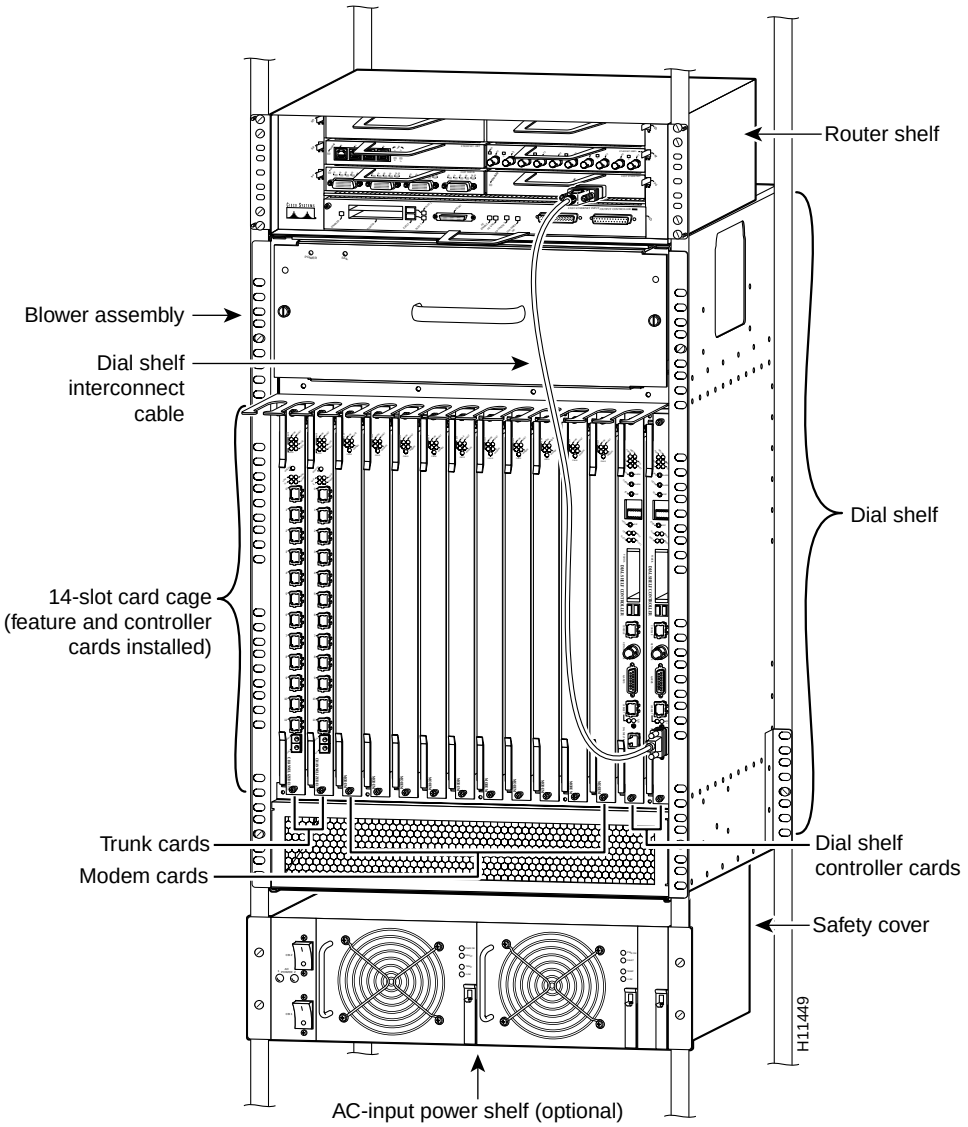


Figure 1-2 Cisco AS5800—Rear View

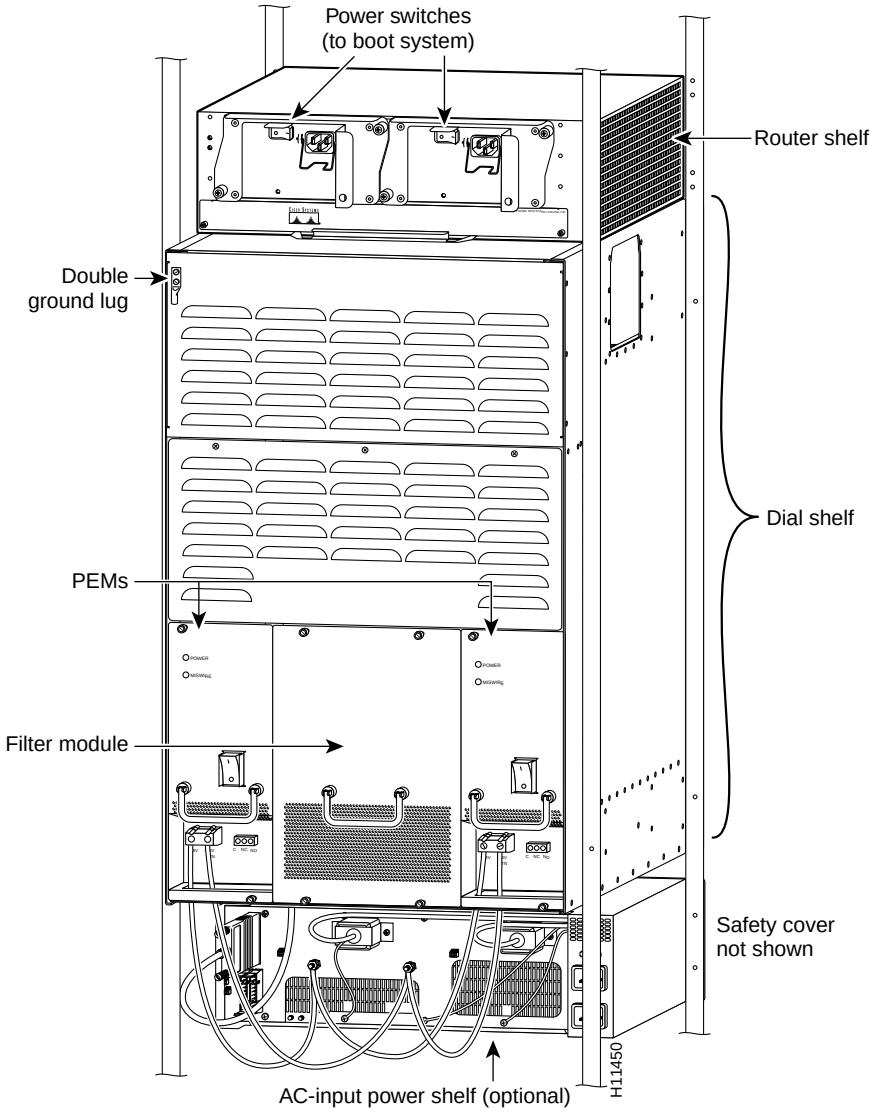


Figure 1-3 Cisco AS5800 with Enhanced AC-Input Power Shelf—Front View

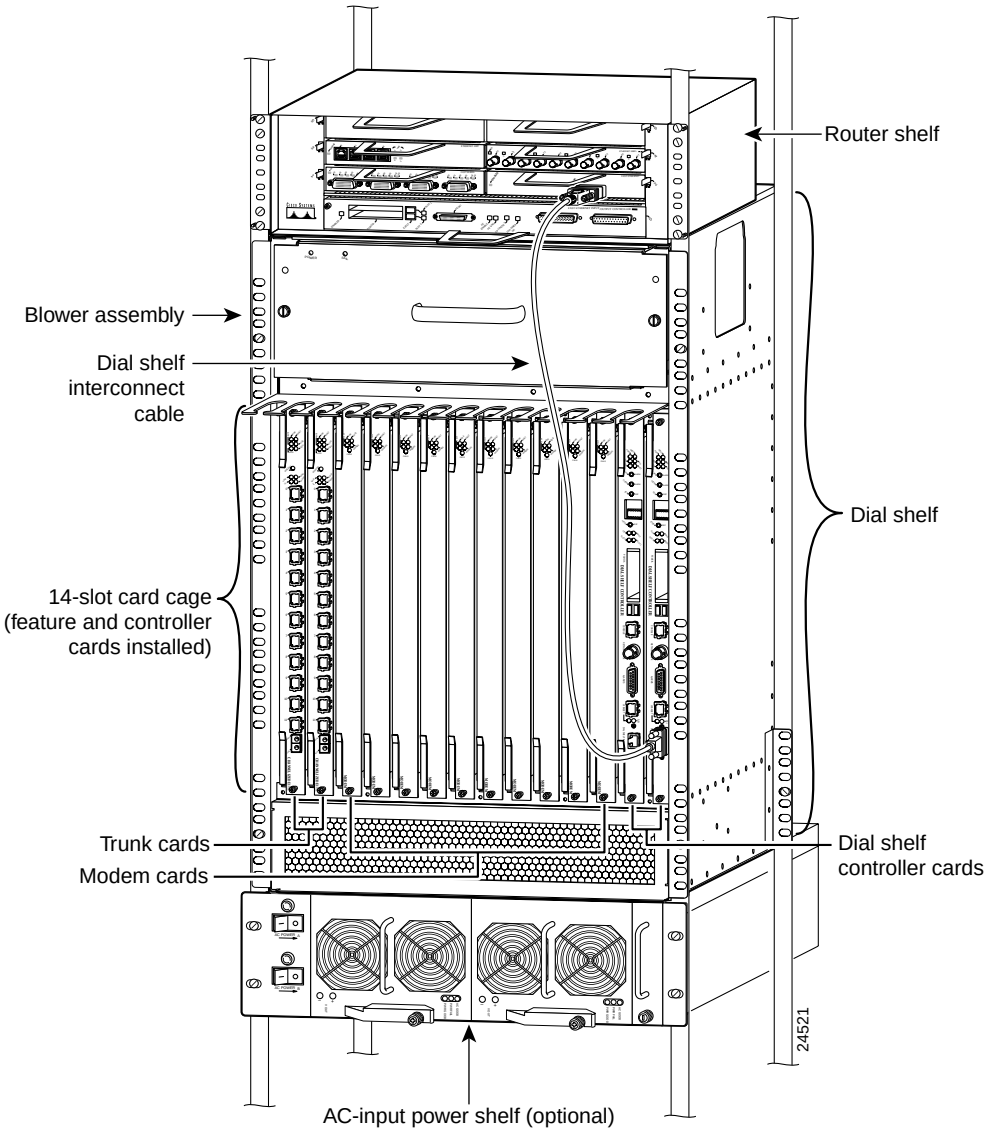
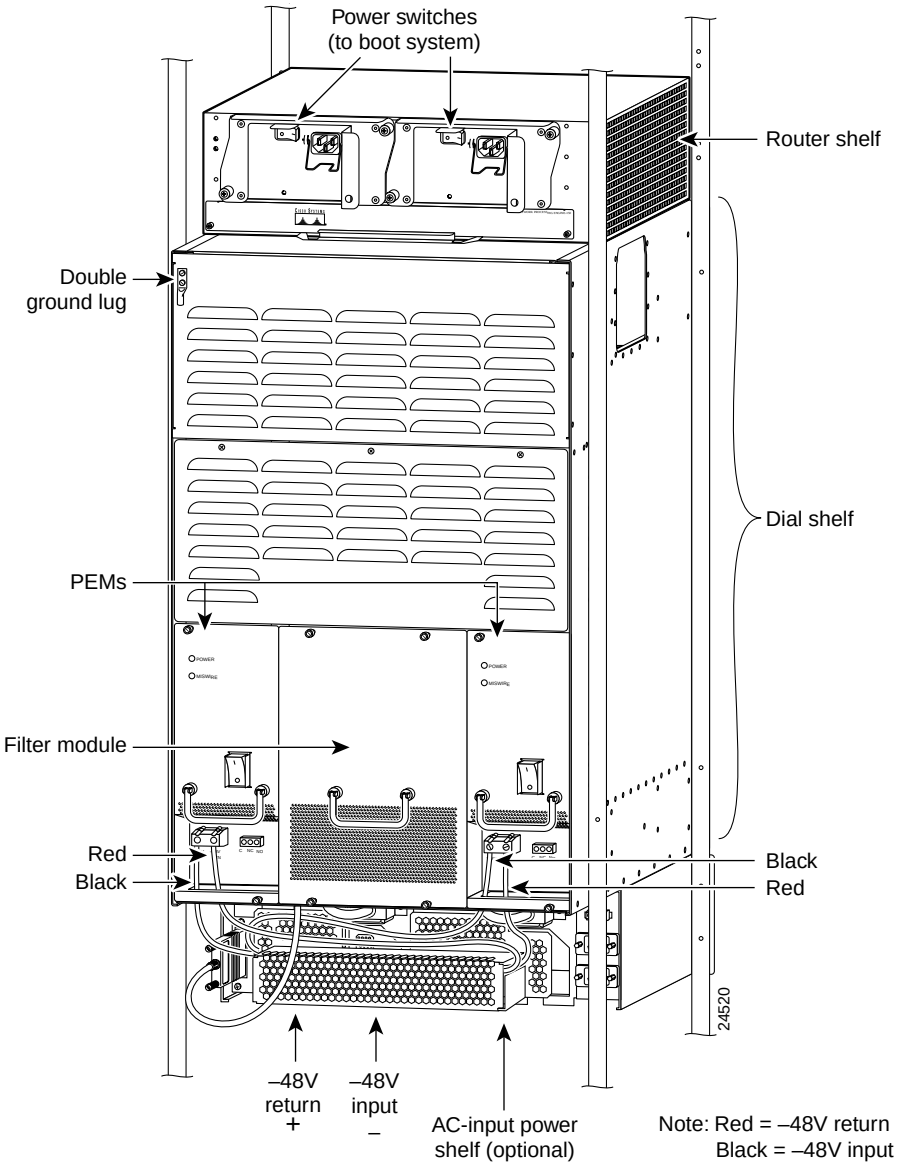


Figure 1-4 Cisco AS5800 with Enhanced AC-Input Power Shelf—Rear View



Functional Overview

The Cisco AS5800 is a high-density, ISDN and modem WAN aggregation system that provides both digital and analog call termination. It is intended to be used in service-provider dial point-of-presence (POP) or centralized-enterprise dial environments. The dial shelf cards and the host router shelf communicate over a nonblocking interconnect that supports 100-Mbps full-duplex service.

The Cisco AS5800 supports high-density dial aggregation and integrates with Cisco AS5200 and AS5300 access servers for scaling your service provider network. The access server also supports high availability of service through online insertion and removal (OIR) capabilities and redundant power supplies that are hot swappable. All active components within the dial shelf chassis support OIR, which allows components to be removed or replaced while the system is powered on. Dial shelf cards can be busied-out through the software to avoid loss of calls.

Caution In order to maintain traffic flow in a single dial shelf controller (DSC) configuration, the DSC shouldn't be removed while the system is operational. If the DSC is removed, the interconnect link between the DSC and router shelf will be lost and all other dial shelf cards will go down. The router console port will display the following message:

```
AUG 2 10:57:02.017 CST: %DSC_REDUNDANCY-3-BICLINK: Link to active DSC down
```

The access server includes a Cisco 5814 dial shelf and a Cisco 7206 router shelf. If you are installing multiple access servers, a system controller is available, which provides a "single system" view of multiple POPs.

The system controller for the access server includes the Cisco 3640 router running Cisco IOS software. The system controller can be installed at a remote facility so that you can access multiple systems through a console port or Web interface. You can download software configurations to any Cisco AS5800 using Simple Network Management Protocol (SNMP) or a Telnet connection. The system controller also provides performance monitoring and accounting data collection and logging.

In addition to the system controller, a network management system with a graphical user interface (GUI) runs on a UNIX SPARC station and includes a database management system, polling engine, trap management, and map integration.

The dial shelf contains ingress interfaces (CT3/CT1/CE1/PRI) that terminate ISDN and modem calls, and break out individual calls (DS0s) from the appropriate telco services. Digital or ISDN calls are terminated onboard the trunk card HDLC controllers, and analog calls are sent to modem resources on the modem cards. As a result, any DS0 can be mapped to any HDLC controller or modem module.You can install multiple ingress interface cards of like or different types, which enables you to configure your systems as fully operative, port redundant, or card redundant, depending on your needs.

Trunk cards and modem cards are tied together across a time division multiplexing (TDM) bus on the dial shelf backplane. The backplane TDM bus transmits and receives PCM-encoded analog data to and from the modem cards. Then the dial shelf and the router shelf exchange framed packets using a proprietary interconnect cable for further processing.

The dial shelf also contains a DSC card that provides clock and power control to the dial shelf cards. Each dial shelf controller card contains a block of logic referred to as the common logic and system clocks. This block generates the backplane Stratum-4 compliant 4-MHz and 8-KHz clocks used for interface timing and for the TDM bus data movement. The common logic can use a variety of sources to generate the system timing, including an E1 or T1 input signal from the BNC connector on the dial shelf controller card front panel. The clock source can also be telco office timing units (BITS clocking) extracted from the network ingress interfaces.

On the DSC card, only one common logic is active at any one time, which is identified by the CLK (clock) LED on the DSC card front panel. The active common logic is user selectable and is independent from each dial shelf controller card. This assures that if a DSC card needs replacing or if the slave DSC card becomes the master, clocking remains stable. The selected common logic should not be changed during normal operation, unless related hardware failure is suspected or diagnosed.

The Cisco 7206 router shelf supports call signaling for PRI interfaces; packet processing, and routing; and all commonly used high-speed LAN and WAN interfaces including Fast Ethernet (FE), Asynchronous Transfer Mode (ATM), High-Speed Serial Interface (HSSI), and Fiber Distributed Data Interface (FDDI). These interfaces are supported by common port adapters that are configured on the Cisco 7206 router shelf.

You can install and upgrade software remotely, without affecting current system operation. You can also upload and download configuration files remotely, without affecting current system operation. Remote access is enabled by use of SNMP, by a Telnet session to a console port on the router shelf, through the World Wide Web (WWW) interface, or through use of the optional system controller network management system.

The Cisco AS5800 can dynamically adjust any port to support any user configuration. Individual users can be authenticated as they connect to the system by use of one or more authentication servers using RADIUS and TACACS+ authentication protocols. Primary and backup authentication servers can define user authentication parameters using user domain and the number called. User profile information can also be configured to include time of day, number of simultaneous sessions, and number of B channels used.

When a remote user connects to the access server using a modem or an ISDN line, the user is authenticated, and establishes a session. Dynamic address assignment from an authentication server or static address assignment connects the user and has virtually no impact on service provider routing tables.

A remote LAN user can connect to the access server using an ISDN line or asynchronous serial connection, be authenticated, and establish a session. In addition to dynamic or static address assignment, this connection requires the traditional Cisco IOS software support for different routing protocols on different ports simultaneously, with virtually no impact on service provider routing tables.

A dial wholesale customer can connect to a Cisco AS5800, then tunnel PPP packet information to a retail service provider using dial virtual private network (dial VPN).

For detailed system specification tables, refer to Appendix A, “Cisco AS5800 Specifications.”

Cisco 5814 Dial Shelf

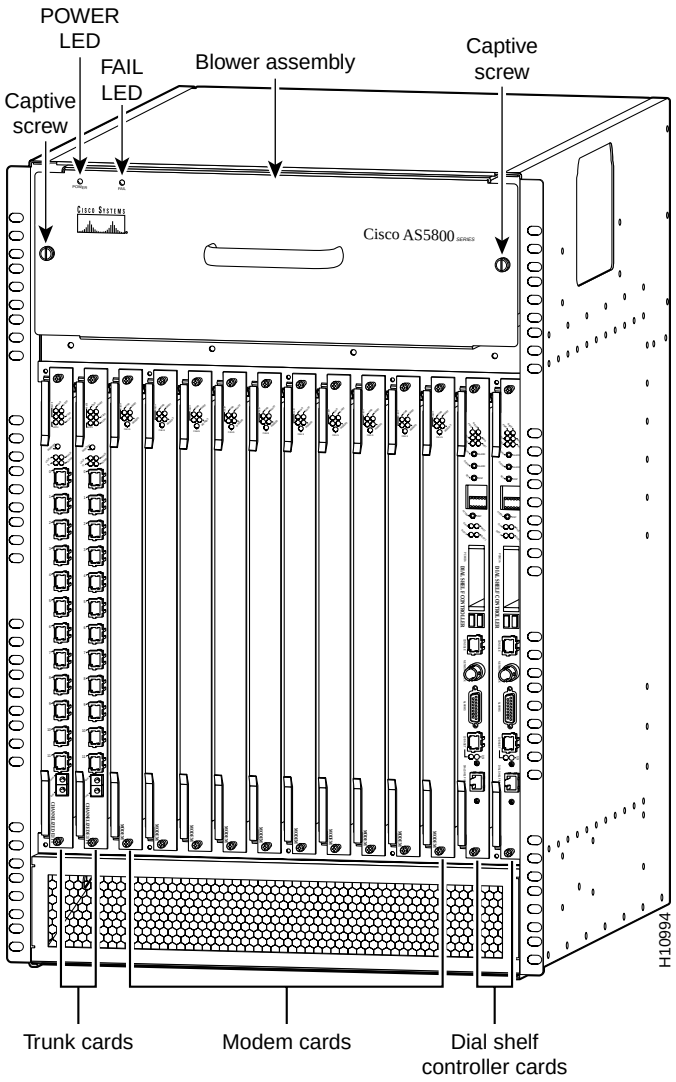
The Cisco 5814 dial shelf contains 14 slots (numbered 0 to 13 on the backplane) and can support as many as 10 modem cards, 2 T3 or 4 T1 trunk cards, and 2 dial shelf controllers (DSCs). Slots 12 and 13 in the dial shelf are dedicated slots for the DSCs. Metal guard pins on the backplane module prevent you from installing any other type of card in these two slots. The modular chassis supports online insertion and removal (OIR) and redundant power and includes environmental monitoring and feedback control.

The dial shelf contains CT1/CE1 or CT3 Primary Rate Interfaces (PRIs) that terminate ISDN and modem calls and break out individual calls from the appropriate telco services. Digital signal level 0 (DS0) or ISDN calls are terminated on the trunk card High-Level Data Link Control (HDLC) controllers, and analog calls are sent to modem resources on the modem cards. As a result, any DS0

can be mapped to any HDLC controller or modem module. You can install multiple ingress interface cards of like or different types, which enables you to configure your systems as fully operative, port redundant, or card redundant, depending on your specific needs.

Figure 1-5 shows the Cisco 5814 dial shelf, fully loaded.

Figure 1-5 Cisco 5814 Dial Shelf



Clock Management

The DSCs also provide clock and power control to the dial shelf cards. Each DSC contains a block of logic that is referred to as the common logic and system clocks. This block of logic can use a variety of sources to generate the system timing, including an E1 or T1/T3 input signal from the BNC connector on the DSC's front panel.

Only one common logic is active at any one time, which is identified by the clock (CLK) LED on the DSC's front panel. The active common logic is user-selectable and is independent from each DSC. This assures that if a DSC needs replacing or if the slave DSC becomes the master, clocking remains stable. The selected common logic should not be changed during normal operation, unless related hardware failure is suspected or diagnosed.

The configuration commands for the master clock specify the various clock sources and a priority for each source. Together these commands define a list, ordered by priority, of the clock sources used to generate the master clock. The prioritized list, configured on the router shelves, is passed to and stored by the DSC providing the active clock. In the event of failure of the highest-priority clock source, the DSC switches to the source with the next highest priority.

With a split dial shelf, the clock sources can be configured on either of the router shelves. Typically a router configures clock sources only from the slots that it owns; clock sources can be configured from other slots, but they are ignored. On the dial shelf, all valid clock source configurations need to be known to the DSC providing the clock, including the clock source configurations on the router connected to the other DSC.

In a typical Cisco AS5800 configuration (without a split dial shelf), clock source configuration lines that specify an external clock are sent directly from the router shelf to both DSCs. In the split dial shelf configuration, a router can send the clock source configuration only to the DSC to which it is connected, not to both DSCs. If an external clock is used in a split dial shelf configuration, it must be configured identically on both router shelves and must be physically connected to both DSCs.

An error condition can arise if a clock input on one router is configured to have the same priority as a clock input configured on the other router. However, the command is not rejected, because the values configured on the other router may not be known. Warning messages are issued to both routers when this condition is detected. Two clock inputs specified with identical priorities both go into the ordered list of clock sources, but the one received first by the DSC providing the active clock is assigned a higher priority.

The **show dial-shelf clocks** command shows all configured clock sources, even those from non-owned trunk cards. Only one DSC can provide the master clock; however, backup clock sources might need to be configured for all trunk cards present (regardless of which DSC owns them).

Dial Shelf OIR Events

Each DSC needs to know whether it is to operate in split mode or normal mode, and in split mode it needs to know which slots are owned by its connected router. Currently the DSCs receive inventory messages from the router shelves, informing them which cards the routers think are present in the dial shelf. In split mode operation, these messages have been extended to inform the DSC which mode is current and the set of slots it owns.

Split dial shelf configurations are managed by having the slots that are owned by one router appearing to the other router as empty slots. A router shelf is informed of dial shelf OIR events by messages that are sent to the router shelf when a card is inserted in or removed from a slot. In the split dial shelf configuration, once a DSC is informed by the connected router which slots it owns, it sends messages only for dial shelf OIR events that occur in those slots. The hub on each DSC is configured to ignore traffic from cards in non-owned slots.

Dial Shelf Card Bootup

When a dial shelf card starts running, it sends a message to the DSC. The DSC determines whether it is the master for that slot. In the split dial shelf mode, only the DSC whose connected router owns the slot containing the dial shelf card responds to the message. The dial shelf card accepts firmware and a bootstrap image from that DSC and configures itself to communicate through that DSC's hub.

The first time a router shelf sends an inventory response to the DSC, it includes a flag indicating that all dial shelf cards should be reloaded. In split mode, the final dial shelf card image is downloaded by each DSC from the router shelf that owns it.

Slot Ownership Arbitration

The DSCs communicate between themselves to determine which one is to be active, where "being active" implies being the master for all the dial shelf card slots. In split mode, each DSC is the master for the set of dial shelf cards in the slots owned by its connected router. Additional messages indicate when DSCs are in split mode and what set of slots they control.

A DSC that is already in split mode simply advertises that it is in split mode and which slots it is claiming. When a second DSC receives an indication that the first DSC is in split mode, its behavior depends on the current configuration of its attached router.

- If the attached router is not configured for split mode, the second DSC sends error messages to its connected router and indicates its router's state to the first DSC. The first DSC issues the same error messages to its router.
- If one attached router is configured in split mode and the other is in normal mode, the router that is in normal mode stops claiming ownership of any slots and does not respond to boot requests from any of the dial shelf cards. The router that is in split mode responds to boot requests only from dial shelf cards in the slots that it owns. However, it does not take over (restart) the dial shelf cards in its slots until the normal mode router is removed or is also configured in split mode.

Hub Redundancy

In normal mode, both DSCs are connected to the same router shelf. The active DSC monitors the status of its link to the router shelf and, in the event of link failure, requests the other DSC to take over. When operating in split mode, each DSC is connected to a different router shelf, so the DSCs do not send or respond to link failure messages. If one DSC's link fails, the other DSC cannot transparently take over.

TDM Resource Allocation

Trunk cards and modem cards are tied together across a time-division multiplexing (TDM) bus on the dial shelf backplane. Time slots for the TDM bus are allocated by the router shelf on a call-by-call basis. This is implemented by initializing a queue at start up with one element for each usable time slot (currently 14*128 = 1,792 time slots are used). Time slots for a call are allocated from the front of the queue and replaced at the end of the queue when the call is completed. For split dial shelf operation, time slots are added to the queue dynamically, as they are needed. When a TDM slot is required and the queue is empty, a chunk of TDM slots is allocated to the queue.

In normal mode, the router shelf connected to the DSC in slot 12 allocates time slots starting from 0 going up, and the router shelf connected to the DSC in slot 13 allocates time slots starting from 1,791 going down. For split dial shelf operation each router is assigned half of the usable set of time slots. The router shelf connected to the DSC in slot 12 controls the first half of the time slots (0 to 895). The router shelf connected to the DSC in slot 13 controls the second half of the time slots (896 to 1791).

Environmental Monitoring

In split mode, environmental monitoring for the full dial shelf is carried out by both DSCs. This means that warnings about overheating cards go to both router shelves, regardless of which one owns the card (or even if neither claims ownership of the card). Sending the warnings to both routers reduces the chance of an environmental problem going unreported.

For detailed dial shelf specification tables, refer to Appendix A, “Cisco AS5800 Specifications.”

Dial Shelf Field-Replaceable Units

The Cisco AS5800 is designed to make component removal and replacement easy. This section describes the Cisco 5814 dial shelf field-replaceable units (FRUs) only. For Cisco 7206 router shelf FRU information, refer to the *Cisco 7206 Series Installation and Configuration Guide* that shipped with your router shelf.

Table 1-1 describes available Cisco 5814 dial shelf FRUs that can be ordered as spares.

Table 1-1 Dial Shelf Field Replaceable Units

Field-Replaceable Unit	Product Number
T1 trunk card	DS58-12CT1=
E1 trunk card	DS58-12CE1=
T3 trunk card	DS58-1CT3=
DMM modem card	DS58-144CM-CC=
VoIP card	DS58-192VOX
Dial shelf controller card	DS58-DSC=
5814 backplane	MAS-5814BP=
Blank filler cards	DS58-BLANK=
Blower assembly	DS58-FAN=
Filter module	DS5814-DC-FLT=
Power-entry module	DS5814-DC-PEM=
Dial shelf interconnect port adapter and dial shelf interconnect cable[1]	PA-DSIC= CAB-DSIC-5= or CAB-DSIC-20=
Rack-mount kit	DS58-RMK=
Dial shelf outer packaging	DS5814-PKG=
AC-input power shelf	DS58-PWR-2AC=
AC-input single power supply	DS58-PWR-AC=

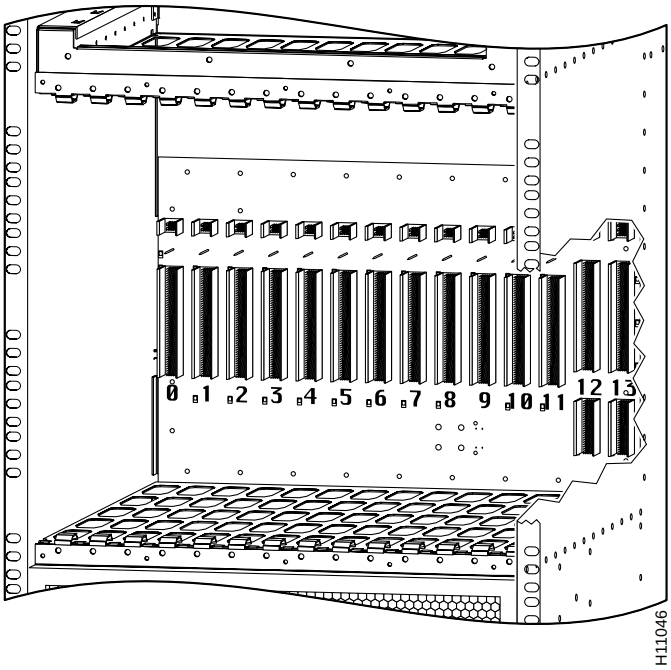
1 This module actually installs into the Cisco 7206 router shelf, but can only be used in conjunction with a Cisco 5814 dial shelf.

For information about the trunk cards, modem cards, and Voice over IP cards used in the Cisco 5814 dial shelf, refer to the *Cisco AS5800 Universal Access Server Dial Shelf Card Guide* that shipped with your system. For information about other FRUs, review the rest of this chapter, or for detailed specification tables, refer to Appendix A, “Cisco AS5800 Specifications.”

Dial Shelf Backplane

The Cisco AS5800 is equipped with a field-replaceable backplane module, which is designed to meet critical safety, isolation, and electromagnetic compatibility (EMC) requirements. The Cisco 5814 dial shelf backplane includes 14 slots that seat the ingress trunk cards, the modem cards, and the dial shelf controller cards. Figure 1-6 shows the Cisco 5814 dial shelf with no cards installed, as viewed from the system front.

Figure 1-6 Cisco 5814 Dial Shelf Backplane—Front View

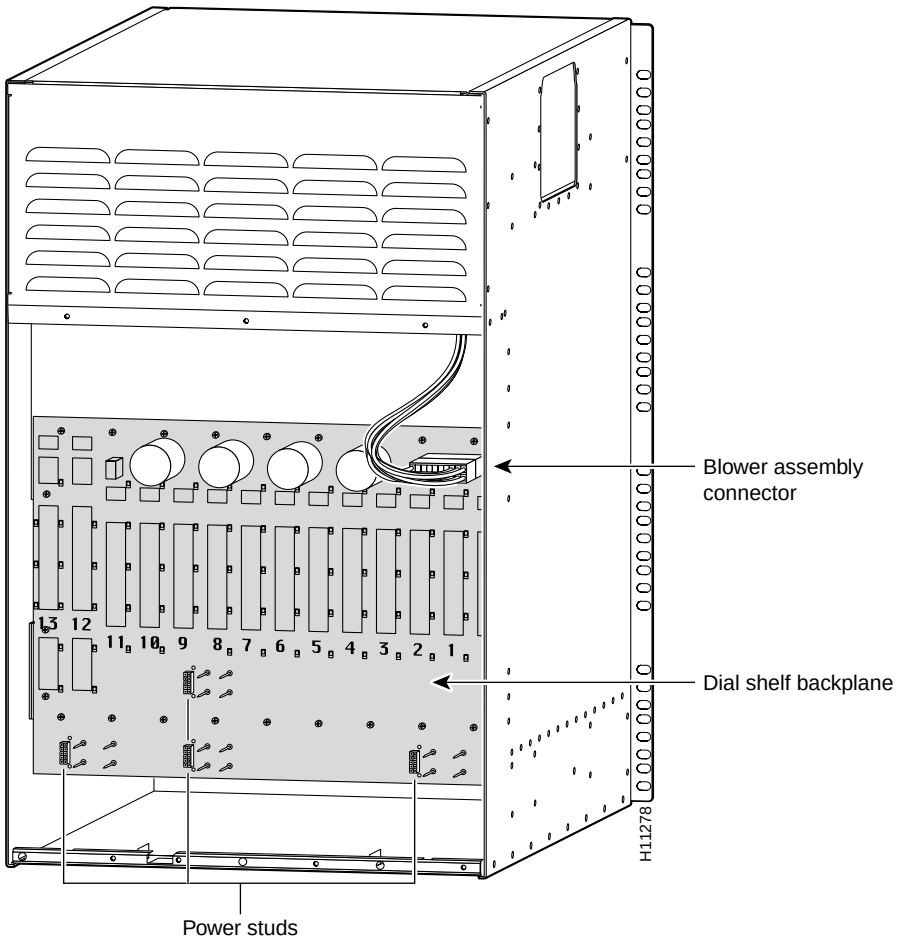


The dial shelf backplane contains no active components, except for the nonvolatile random-access memory (NVRAM) used for system identification. This is located toward the top of the backplane and provides 1024 bits of nonvolatile read-write memory.

The dial shelf backplane contains the connectors that connect directly with the dial shelf cards and dial shelf controller cards. It also includes a 20-pin molex MiniFit connector that connects to the blower assembly. The dial shelf backplane also includes additional maintenance bus (MBus) connectors to the power-entry modules (PEMs) and filter module, which are used for monitoring environmental conditions. These backplane connectors are shown in Figure 1-7.

Note Figure 1-7 shows a rear view of the dial shelf backplane after the PEMs, filter module, and chassis back panel have been removed.

Figure 1-7 Cisco 5814 Dial Shelf Backplane—Rear View



The dial shelf backplane first receives –48 VDC power from the DC-input power supplies by way of the filter module, and the power is then distributed throughout the dial shelf. The DC PEMs connect to the backplane using four blind-mating 1.25-in. power studs, which are located near the bottom of the backplane.

Three bus connections are routed over the backplane:

- The backplane interconnect bus (BIC bus) connects the dial shelf cards to the dial shelf controller cards and provides communication between the dial shelf and the router shelf.
- The TDM bus transmits clocks and frame pulses to all dial shelf cards and dial shelf controller cards.
- The maintenance bus (MBus) monitors system environmental conditions.

For detailed specification tables, refer to Appendix A, “Cisco AS5800 Specifications.”

Dial Shelf Blower Assembly

The blower assembly in the Cisco 5814 dial shelf monitors the dial shelf internal operating temperatures and maintains acceptable cooling parameters. The blower assembly contains three variable-speed impeller fans and a controller card that performs the following functions:

- Monitors internal temperatures

  The controller card contains temperature sensors, which monitor internal air temperature within the dial shelf chassis. These temperature sensors, along with other system maintenance sensors, can detect areas exceeding the temperature set point.

- Controls fan operation

  Fan speed is controlled by a microprocessor on the controller card. If air temperature within the dial shelf chassis exceeds the acceptable operating range, the controller card increases the fan speed in an attempt to control the temperature. If temperatures continue to rise, the controller card linearly increases fan speed until the fans reach full speed. If acceptable operating temperatures are still unobtainable, the system environmental monitor shuts down all internal power, thus preventing equipment damage from excessive heat.

  During normal operation, the three fans “load-share” to provide cooling. If one of the three fans fails, a warning message displays on your console screen. The controller card then increases the speed of the remaining operative fans to maintain acceptable temperature levels.

  When all three fans are operating normally, fan speed is 1,600 rpm. As ambient air temperature increases, fan speed increases accordingly. Thus, if one of the fans becomes inoperative, the remaining fans increase fan speed to 2,400 rpm.

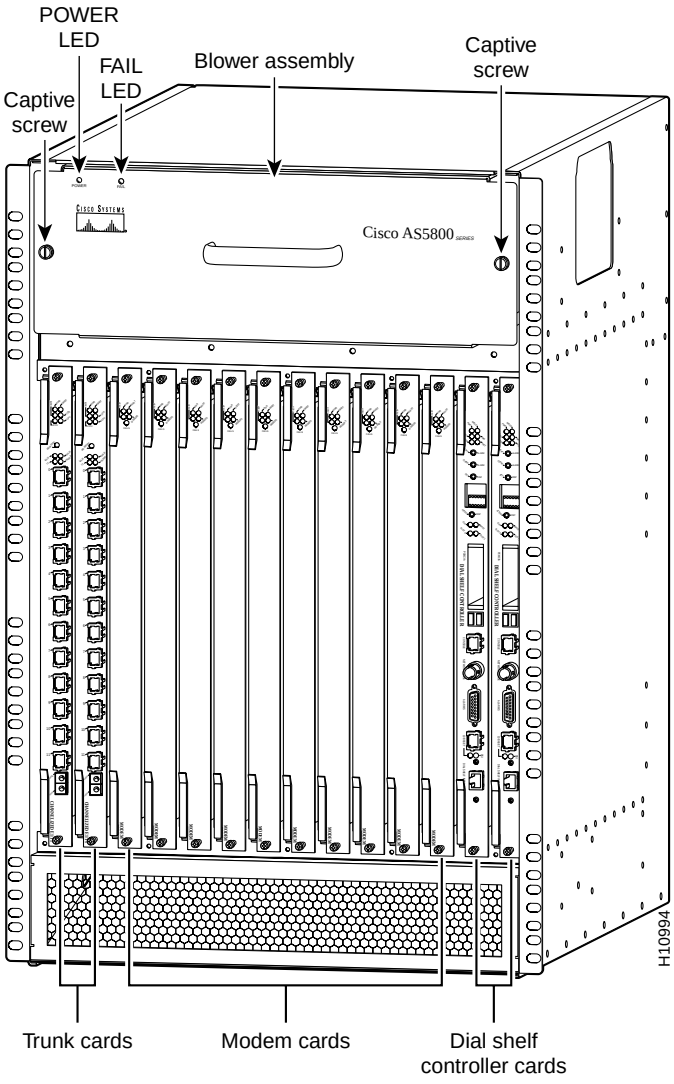
- Supports OIR

  The blower assembly supports OIR, which means you can remove and replace the blower assembly while the system is operating; system operation will not be affected. However, if you expect the replacement process to exceed 1 min, we recommend that you shut down the system. Normal blower assembly replacement is estimated not to exceed 30 sec.

The blower assembly is located directly above the dial shelf cards and dial shelf controller cards in the dial shelf. You install the blower assembly into the front of the dial shelf chassis where it plugs directly into the dial shelf backplane. Figure 1-14 shows the location of the blower assembly in a fully configured Cisco 5814 dial shelf, as viewed from the front of the system.

For detailed specification tables, refer to Appendix A, “Cisco AS5800 Specifications.”

Figure 1-8 Cisco 5814 Dial Shelf with Blower Assembly Installed—Front View



Dial Shelf Controller Card

The dial shelf controller card is the main processor card for the dial shelf, and it performs the following functions:

- Links the dial shelf to the router shelf, where data is transferred as Ethernet packets encapsulated in proprietary protocol
- Interconnects trunk cards and modem cards

  A backplane interconnect concentrator on each dial shelf controller card connects to each dial shelf card installed in the dial shelf.
- Boots and reloads software images
- Provides source clocks used by all dial shelf cards and power supplies
- Extracts an external reference clock from an external E1 or T1 signal through a BNC connector on the front panel
- Connects to an external alarm source through a DB-15 serial connector located on the front panel

Install the dial shelf controller card in the Cisco 5814 dial shelf in either of the two far-right slots (numbered 12 and 13). The card plugs directly into the backplane.

The dial shelf controller card consists of the following components:

- CPU (IDT R4700)
- 150-MHz microprocessor
- I/O controller
- Onboard Flash memory
- PCMCIA Flash memory
- Boot Flash memory
- EPROM

For detailed specification tables, refer to Appendix A, “Cisco AS5800 Specifications.”

Table 1-2 lists the dial shelf controller card memory components and product numbers.

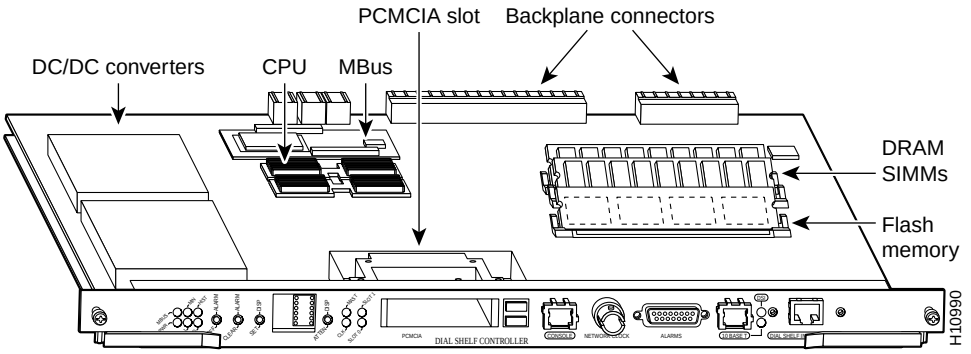
Table 1-2 Dial Shelf Controller Card Memory Components

Memory Type	Size	Quantity	Product Number
DRAM	32 MB	2 16-MB SIMMS	MEM-DS58-16M
PCMCIA Flash (choose one)	8 MB	1	MEM-DS58-FLC8M=
	16 MB	1	MEM-DS58-FLC16M=
	20 MB	1	MEM-DS58-FLC20M=

Note DRAM for the DSC card is not orderable as a spare. Contact Cisco’s Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com for a replacement if you believe your DSC card DRAM is faulty.

Figure 1-9 shows the dial shelf controller card components.

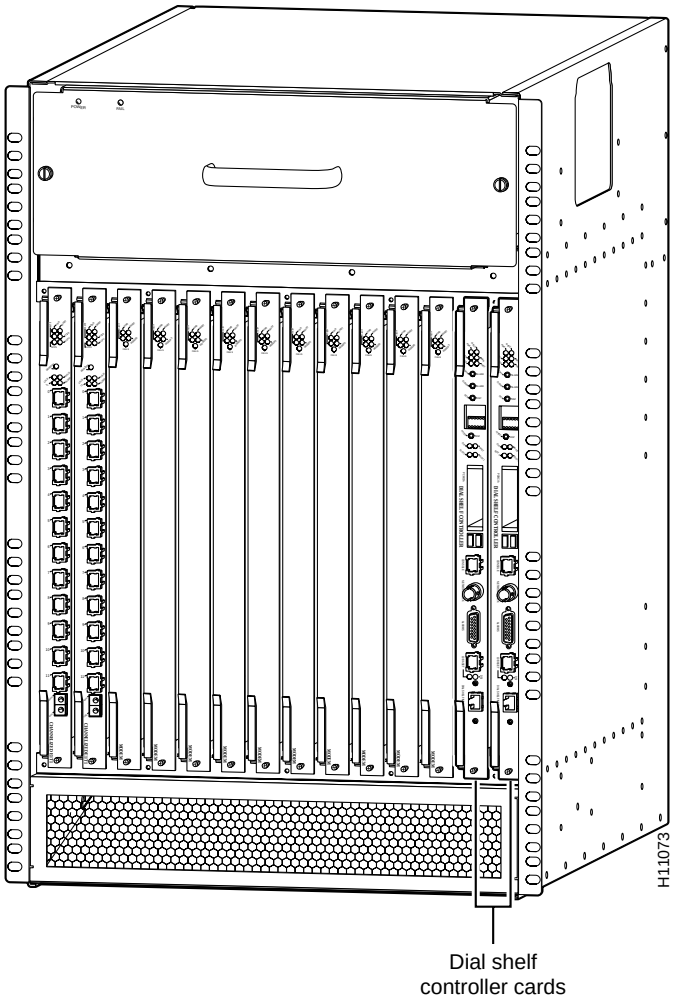
Figure 1-9 Dial Shelf Controller Card Components



Note The access server supports two dial shelf controller cards for a redundant connection to the router shelf or for a split shelf configuration.

Figure 1-10 shows the front view of the Cisco 5814 dial shelf with two dial shelf controller cards installed.

Figure 1-10 Cisco 5814 Dial Shelf with Dial Shelf Controller Cards Installed—Front View



LED Indicators and Alarm Buttons

The dial shelf controller card front panel contains several LEDs, push buttons, LCDs, and connectors. Unlike the other dial shelf cards installed in the Cisco 5814 dial shelf, the dial shelf controller card has two power LEDs, one for the card and the other for the system MBus power.

Figure 1-11 shows the dial shelf controller card front panel LEDs.

Figure 1-11 Dial Shelf Controller Card Front Panel LEDs

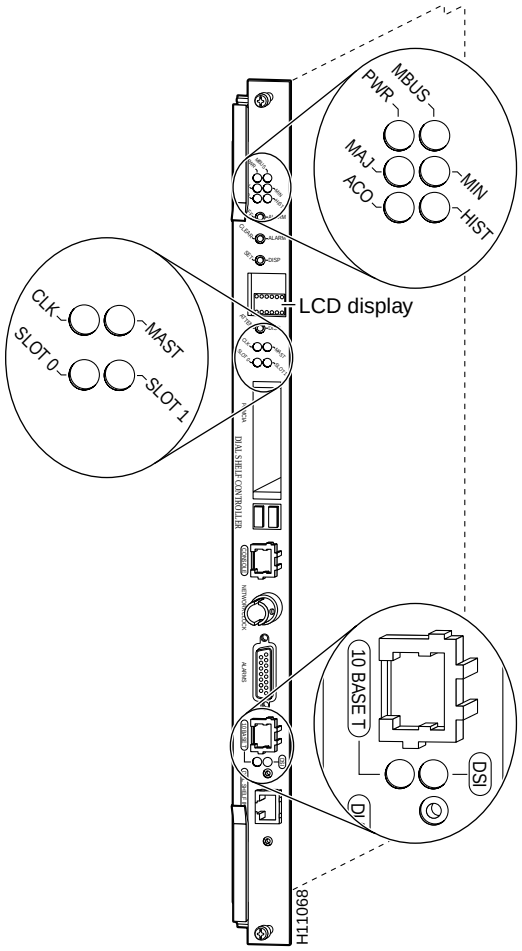


Table 1-3 describes the dial shelf controller front panel LEDs and LCDs.

Table 1-3 Dial Shelf Controller Front Panel LEDs and LCDs

LED Indicator	Display	Description
Power and Warning LEDs		
PWR (dial shelf controller power)	Green	Lights when power is ON.
MBUS (system MBus power)	Green	Lights when the dial shelf controller card is supplying +5 VDC to the system MBus.
MAJ (major alarm)	Yellow	Lights to indicate a major[1] alarm condition.
MIN (minor alarm)	Yellow	Lights to indicate a minor[2] alarm condition.
ACO (alarm cutoff)	Yellow	Lights to indicate the alarm cutoff button has been pressed.
HIST (history clear)	Yellow	Lights when software recognizes a major or minor alarm situation. LED powers off when the Clear Alarm button is pressed and no alarm condition remains.
Clock and Status LEDs		
CLK (clock)	Green	Lights to identify the dial shelf controller card active clock; active clock is independent from master dial shelf controller card designation.
MAST (master)	Green	Lights to indicate the system software recognizes the dial shelf controller card is in master mode.
Slot 0	Green	Lights when PCMCIA slot 0 is in use.
Slot 1	Green	Lights when PCMCIA slot 1 is in use.
Clock and Status LEDs (continued)		
DSI (dial shelf interconnect)	Green	Lights to indicate a working connection between the dial shelf and router shelf.
10BaseT (Ethernet link)	Green	Lights to indicate a working data transfer link connection between the access server and the system controller.
Liquid Crystal Displays		
LCDs (upper and lower)	Alphanumeric; four characters each	Displays ACTV to indicate active (master) card. Displays BKUP to indicate backup (slave) card.

1 A major alarm condition includes router shelf failure, backplane interconnect failure, two-fan failure, power supply failure, dial shelf card failure, or conditional environmental thresholds.

2 A minor alarm condition includes modem SIMM failure, HDLC controller failure, or conditional environmental thresholds.

Figure 1-12 shows the dial shelf controller card front panel push buttons, and Table 1-4 describes push button actions.

Figure 1-12 Dial Shelf Controller Card Front Panel Push Buttons

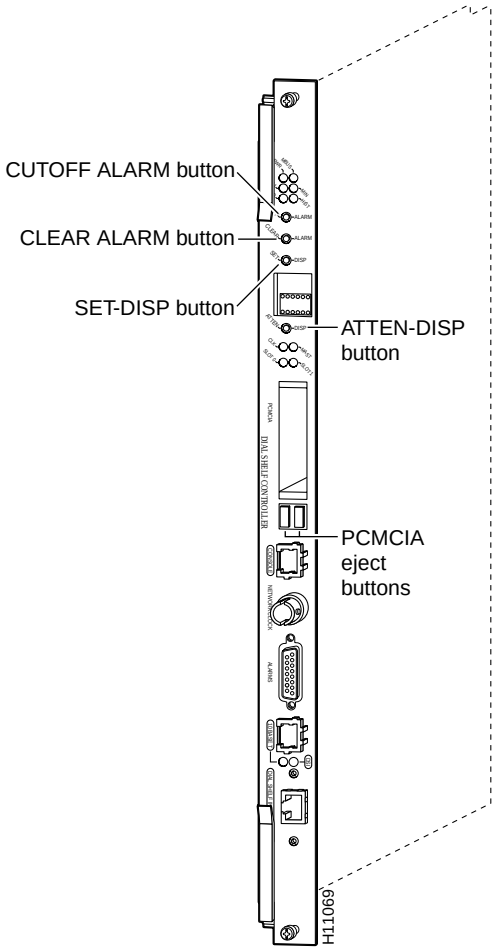


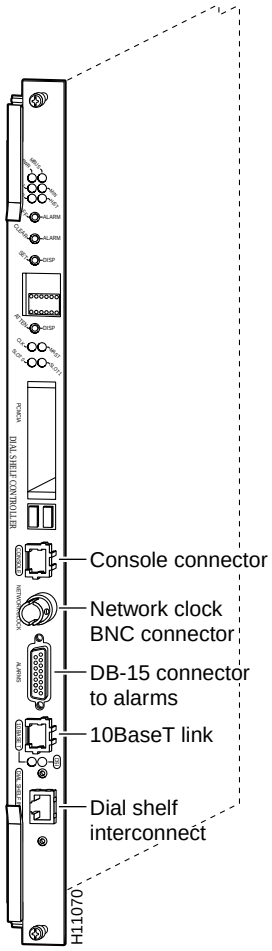
Table 1-4 Dial Shelf Controller Card Pushbuttons

Button	Description
CUTOFF ALARM button	Press to power off external audible and visible alarms until the next alarm condition.
CLEAR ALARM button	Press to power off the HIST LED.
SET-DISP button	Press to enable changes to the dial shelf chassis ID displayed value.
ATTEN-DISP button	Press to signal software to initialize shutdown procedure. Use when performing card replacement (**see caution below**).
PCMCIA eject button	Press to release the PCMCIA flash card from its slot.

Caution Pressing the ATTEN(tion) button on a given DSC has the effect of completely stopping **all** functionality on that DSC. There is **no confirmation** requested if the ATTEN push button is pressed. The DSC is stopped without recourse.

Figure 1-13 shows the dial shelf controller card front panel ports, and Table 1-5 describes the port functions.

Figure 1-13 Dial Shelf Controller Card Ports



Warning To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Note Connect the alarm port only to a safety extra-low voltage (SELV) source rated maximum 50VA, 2A.

Table 1-5 Dial Shelf Controller Card Front Panel Ports

Port	Description
Console	Provides RJ-45 connection to the system controller console port for system management.
Network clock	Provides BNC connection for an external T1 or E1 reference input signal from which a clock is extracted.
Alarms	Provides DB-15 serial connection to an external audio or visual alarm source.
10BaseT	For Cisco internal use only.
Dial shelf interconnect	Provides RJ-45 cable connection to the router shelf.

Common Logic Interface

Each DSC card contains a block of logic referred to as the common logic and system clocks. This block generates the backplane Stratum-4 compliant 4-MHz and 8-kHz clocks used for interface timing and for the TDM bus data movement. The common logic can use a variety of sources to generate this system timing, including an E1 or T1 signal input from the BNC connector on the dial shelf controller card front panel.

Only one common logic is active at a time, identified by the CLK LED on the DSC card front panel. The active common logic is user-selectable and is independent from each DSC card. This assures that if you need to replace a DSC, or if the slave dial shelf controller card becomes the master, clocking remains stable. The selected common logic should not be changed during normal operation unless a hardware failure is suspected or diagnosed in the DSC card.

Dial Shelf DC-Input Power Supply

The Cisco AS5800 is equipped with two power-entry modules (PEMs) in the dial shelf, which accept DC-input power either from your site DC source or from an optional AC-input power shelf, and distribute –48 VDC power to the dial shelf components. The PEMs provide power redundancy and load-sharing; however, a single PEM can power a fully configured system.

Note Whenever possible, we recommend that you connect each PEM to a separate DC power source.

The PEMs and the filter module are cooled by system air flow, which flows from the top to the back of the dial shelf chassis. The front and sides of the PEMs are perforated for minimum air flow restriction.

The PEMs support the following functions:

- Power redundancy and load sharing

  The DC-input power supply provides redundant power by design. During normal operation, the two PEMs provide system power simultaneously (load share). When you remove one PEM, the remaining PEM immediately ramps up to provide full power and maintain uninterrupted system power.

- System environmental monitoring

  A 10-pin connector monitors system environmental status and communicates this status from each PEM to the filter module maintenance bus (MBus). Table 1-6 lists connector pins supporting system status signals.

Table 1-6 Connector Pin Definitions

Pin	Description	Pin	Description
1	–48V monitor	6	Not used
2	Not used	7	Not used
3	Breaker connect	8	–48V return monitor
4	Current monitor	9	Not used
5	Voltage monitor	10	15V_BIAS

- Voltage level and current monitoring

  The DC-input power supply is designed to prevent any energy hazard during operation. DC power is first routed to a circuit breaker, followed by a surge protector. In addition, an isolation diode circuit protects against possible DC-input failure.

  The DC-input power supply monitors analog output voltage and current. The battery side of the DC input is equipped with a 60 A circuit breaker, which trips if current reaches peak parameters for 2 sec. The DC-input power supply circuits are described in Table 1-7.

  If a PEM is not properly seated in the Cisco 5814 dial shelf backplane, an electronic circuit, or interlock, trips a breaker in the PEM and terminates power to the output connectors. This same interlock provides reverse polarity protection when the system is powered off.

Table 1-7 DC-input Power Supply Circuits

Circuit	Description
Circuit breaker	PEM output is enabled when this pin is shorted to the -48Vmonitor pin by way of the backplane. If the connection is broken, the breaker is tripped and cannot be reset until the PEM is reinstalled.
Reverse polarity	An electronic interlock that provides reverse polarity protection.
Current monitor	Analog output voltage is proportional to DC-output current from the PEM to the backplane, as follows: 1 A of current is equivalent to 100 mV at the current monitor pin.
Voltage monitor	Analog output voltage is proportional to DC-output current from the PEM to the backplane, as follows: 1 A of current is equivalent to 100 mV at the voltage monitor pin.
Bell alarm	A terminal block for connecting to central office alarms (C, NC, NO)

Note Connect the alarm port only to a SELV source rated maximum 50VA, 2A.

- Bell alarm signaling

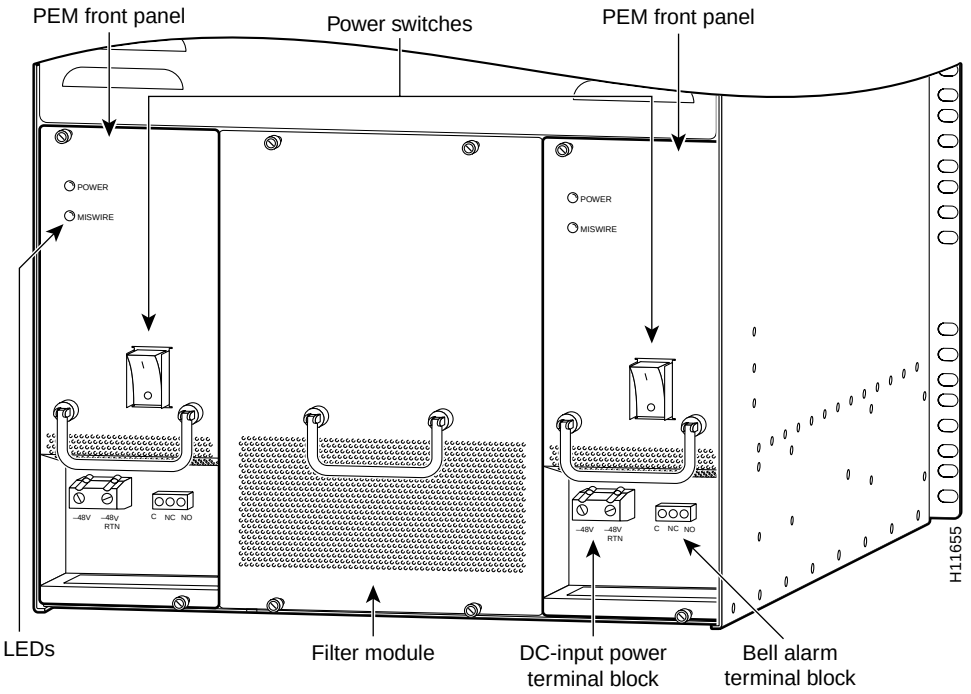
  The PEMs provide relay outputs for standard central office bell alarms. These bell alarm contacts are available on a terminal plug mounted on the PEM front panel.

- Online insertion and removal (OIR)

  The PEMs support OIR, which means that you can remove or replace a PEM while the system is operating; system operation is not affected.

The PEMs are located on either side of the filter module below a removable rear cover. Figure 1-14 shows the location of the PEMs as viewed from the dial shelf rear.

Figure 1-14 Power-Entry Modules—Dial Shelf Rear View



The PEMs contain two LEDs on the front panel—POWER and MISWIRE. The POWER LED indicates that input voltage is present and the PEM circuit breaker is on; the MISWIRE LED should remain off, but lights if the two DC conductors entering the PEM DC-input power terminal block (see Figure 1-14) are reversed.

For detailed specification tables, refer to Appendix A, “Cisco AS5800 Specifications.”

Dial Shelf Filter Module

The Cisco AS5800 is equipped with a passive DC power filter in the dial shelf, which contains a broadband electromagnetic interference (EMI) filter and circuitry for monitoring power coming into the dial shelf. The DC power filter is housed in the filter module, which resides in the dial shelf between the two PEMs.

The DC power filter supports the following functions:

- DC-input power filtering and power distribution

  The filter module first receives –48 VDC power from the PEMs using analog isolation circuits. The DC power passes through a broadband EMI filter in the filter module, then passes to a DC-to-DC converter on the dial shelf controller card, where it is converted and then routed back to the backplane for distribution to the dial shelf cards. A single filter module supports a fully configured dial shelf.

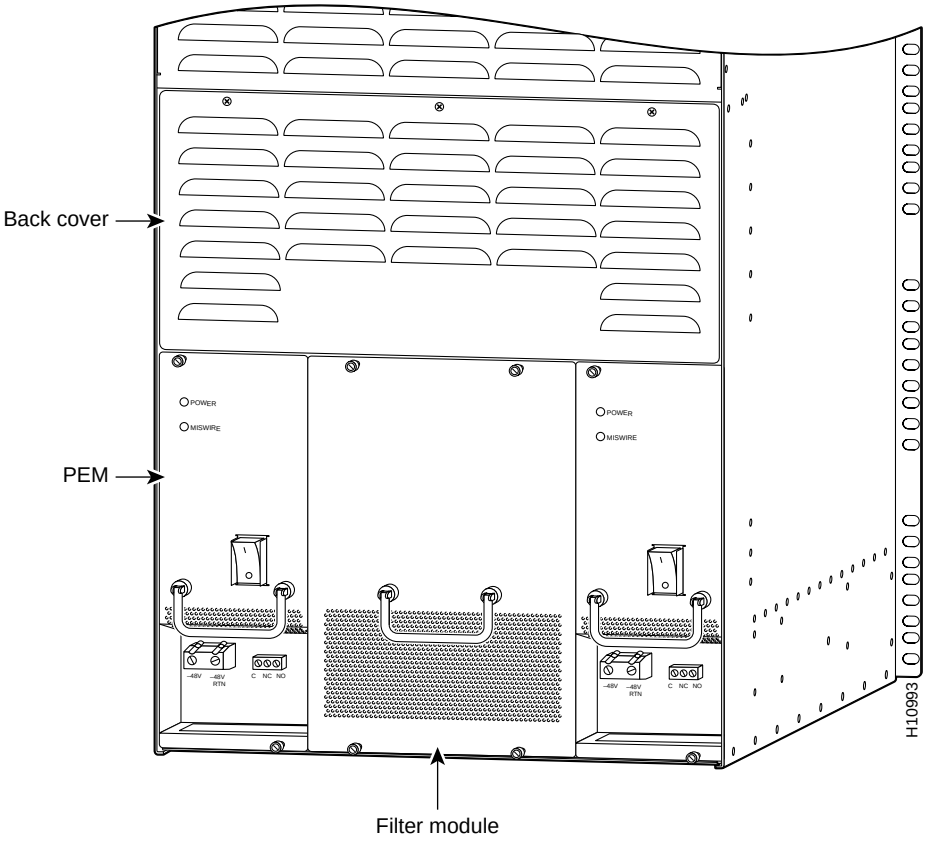
- Maintenance monitoring

  The filter module contains the environmental maintenance bus (MBus) module with a logic card, which carries monitor signals throughout the dial shelf by way of two 10-pin molex MiniFit connectors.

The front and top of the filter module are perforated for minimum air flow restriction. There are no connectors accessible from the front; however, a DB-9 connector at the base of the filter module (visible only from below the dial shelf) connects a monitor cable to an optional AC-input power shelf.

Figure 1-15 shows a filter module installed in the rear of a Cisco 5814 dial shelf.

Figure 1-15 Filter Module—Dial Shelf Rear View



For detailed specification tables, refer to Appendix A, “Cisco AS5800 Specifications.”

Enhanced AC-Input Power Shelf

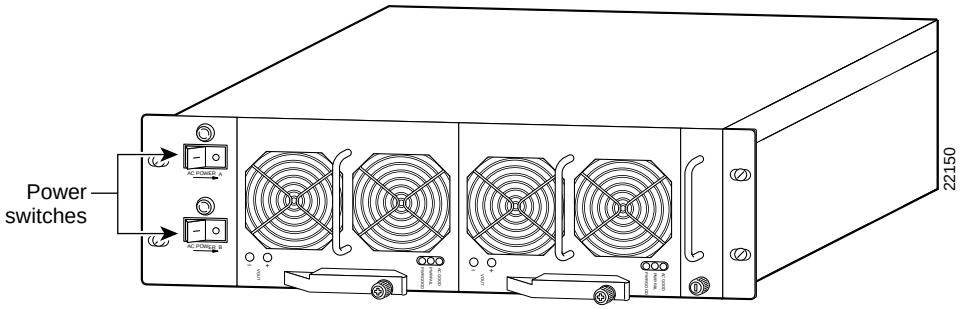
The enhanced AC-input power shelf includes two 2,000-watt (W) AC-input power supplies that plug into a common power backplane in the enhanced AC-input power shelf. A single AC-input power supply is capable of powering a fully configured Cisco 5814 dial shelf. A second power supply provides full redundancy.

During normal operation, the dual AC-input power supplies provide automatic load-sharing, with each power supply supporting 50 percent of the power load. When you remove one of the AC-input power supplies, the remaining power supply immediately ramps up to full power and maintains uninterrupted system power.

Note The AC-input power supplies in the enhanced AC-input power shelf are "hot-swappable," allowing you to remove or replace a power supply while the system is operating; system operation will not be affected. Whenever possible, we recommend that you connect each AC-input power supply to a separate AC power source.

Each AC-input power supply is powered ON by a separate power switch, which is located on the enhanced AC-input power shelf front panel (Figure 1-16). Ejector levers with locking spring clips secure each power supply to the backplane connectors, and a handle on each power supply allows you to remove and replace the power supplies with ease.

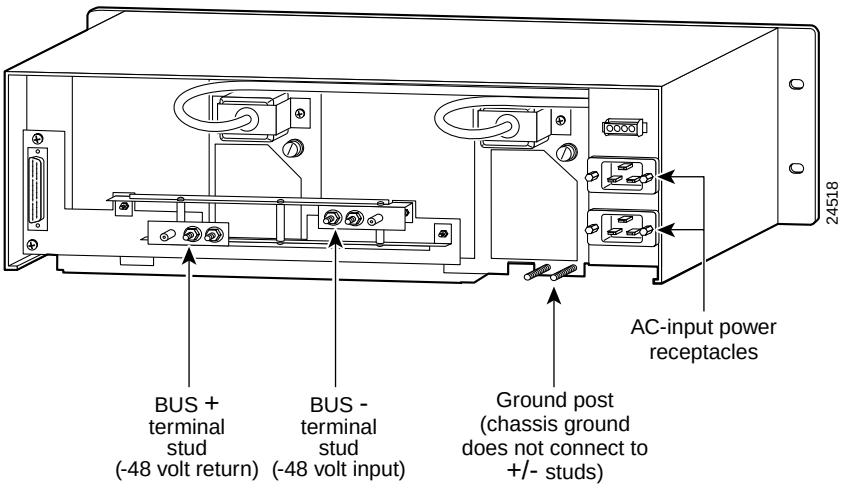
Figure 1-16 Cisco AS5800 Enhanced AC-Input Power Shelf—Front View



The enhanced AC-input power shelf is three rack units high [5.25 in. (13.32 cm)], and mounts underneath the dial shelf in a standard 19-in., 4-post or telco-type rack assembly.

All cable connections for AC-input power, DC-output power, and status signals are made from the enhanced AC-input power shelf rear. (See Figure 1-17) Two modular power cables connect each AC-input power supply to the site AC-input power source. Two DC-interconnect cables provide DC-output power to the dial shelf. A monitor cable provides a status signal connection to the dial shelf filter module maintenance bus (MBus), that monitors voltage tolerance levels, temperature conditions, and power failure in the enhanced AC-input power shelf. A grounding cable provides a ground connection from the enhanced AC-input power shelf to the dial shelf.

Figure 1-17 Cisco AS5800 Enhanced AC-Input Power Shelf—Rear View



For detailed specification tables, refer to Appendix A, "Cisco AS5800 Specifications."

Power Supply Safety Features (Enhanced AC-Input Power Shelf)

The power supplies in the enhanced AC-input power shelf have the following safety features:

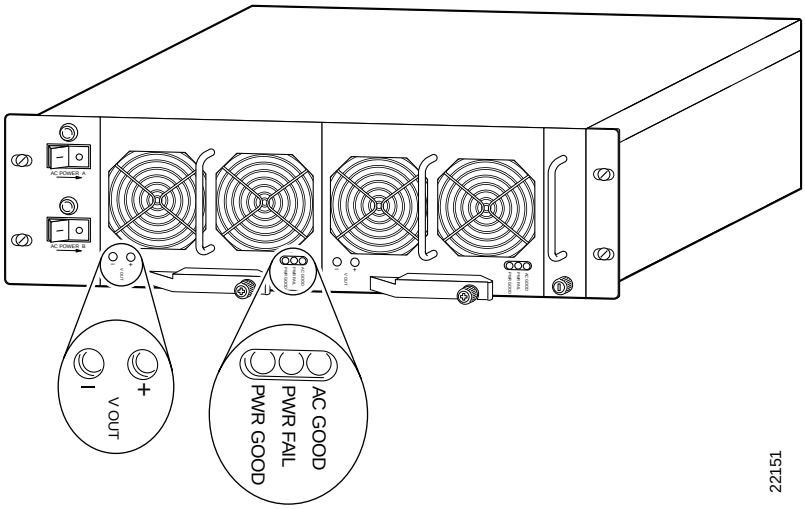
- AC power supplies installed in the enhanced AC-input power shelf are protected against overcurrent by circuit breakers, and against overtemperature by internal protection circuits.
- A metal spring-clip locking mechanism in the ejector levers holds individual AC power supplies in place and prevents the power supply from vibrating or sliding out of the power bay and dislodging from the power backplane.
- Double grounding lugs (as per NEBS requirements) on both the enhanced AC-input power shelf and the dial shelf provide electrical grounding.
- A metal safety cover slides into grooves on the rear underside of the dial shelf to shield the DC power cables from possible short circuit and to protect from electrical shock.
- The power supplies are self-monitoring. Each power supply monitors its own temperature and internal voltages. An internal fan in each power supply draws cooling air from the front of the power shelf, through the power supply, and out the rear of the power shelf. The power supply airflow is separate from that of the rest of the Cisco AS5800 Universal Access Server components.

  Internal monitoring data is passed to the dial shelf through the maintenance bus (MBus) monitoring system. You can view this data through a terminal connected to the router shelf console port. The command to display the monitoring information is described in the *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* (DOC-AS5800-SICG=). The *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* will be replaced by the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide,* available later this year.

Enhanced Power Shelf LED Indicators

The enhanced AC-input power shelf includes two inputs that are located on the left front of the power shelf and three LEDs that are located on the front of each power supply for the enhanced AC-input power shelf (See Figure 1-25.)

Figure 1-18 Enhanced AC-Input Power Supply LEDs



The power supply LEDs for the enhanced AC-input power shelf are summarized in Table 1-8.

Table 1-8 Enhanced AC-Input Power Supply LEDs

LED	Color	Description
AC GOOD	Green	On indicates power is present and within the specified voltage and frequency levels. Blinking indicates an AC power fault condition.
PWR FAIL	Red	On indicates a power fault condition such as overvoltage, undervoltage, overtemperature, or HV bus low.
PWR GOOD	Green	On indicates AC voltage is within specified levels.

Note The voltage test points labeled VOUT + and - are for field use by Cisco approved technicians. Though shown in Figure 1-18, they are not LEDs.

Cisco 7206 Router Shelf

This section provides physical and functional overviews of the Cisco 7206 router shelves. It contains physical descriptions of the router hardware and major components and functional descriptions of hardware-related features.

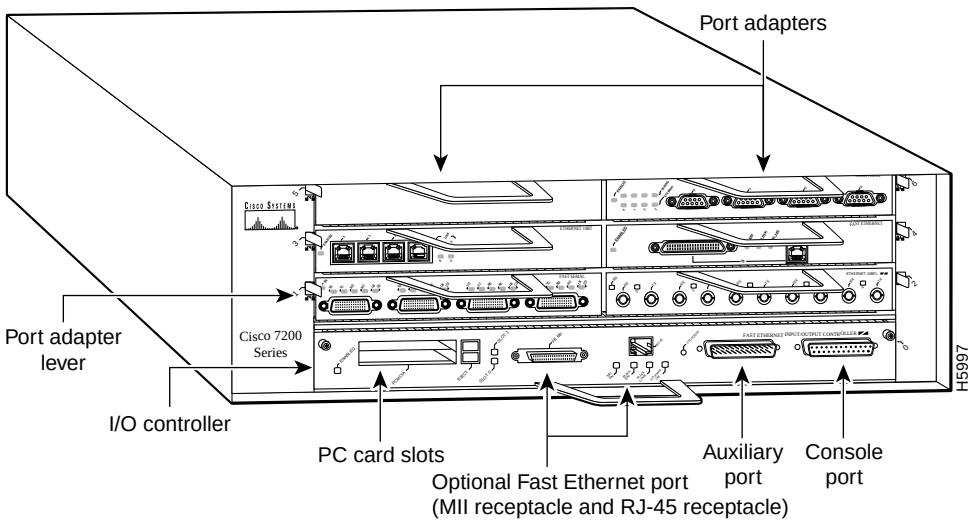
The Cisco 7206 router supports call signaling for PRI interfaces; packet processing; and multiprotocol, multimedia routing and bridging with all commonly used high-speed LAN and WAN interfaces, including Ethernet, Fast Ethernet (FE), Asynchronous Transfer Mode (ATM), High-Speed Serial Interface (HSSI), and Fiber Distributed Data Interface (FDDI).

The Cisco 7206 router shelf handles upper layer routing tasks and provides the following features:

- OIR—Allows you to add, replace, or remove port adapters without interrupting the system or entering any console commands.
- Dual hot-swappable, load-sharing power supplies—Provide system power redundancy; if one power supply or power source fails, the other power supply maintains system power without interruption. Also, when one power supply is powered off, the second power supply immediately takes over the router's power requirements without interrupting normal operation.
- Environmental monitoring and reporting functions—Allow you to maintain normal system operation by resolving adverse environmental conditions prior to loss of operation.
- Downloadable software—Allows you to load new images into Flash memory remotely, for fast, reliable upgrades without having to physically access the Cisco 7206 router.

Figure 1-19 shows the significant Cisco 7206 router components.

Figure 1-19 Cisco 7206 Router Components



Note In Figure 1-19 a blank port adapter is installed in slot 5. To ensure adequate airflow across the port adapters, each slot must be filled with either a port adapter or a blank port adapter.

Network Interfaces

Network interfaces reside on port adapters that provide the connection between the router's three peripheral component interconnect (PCI) buses and external networks. The Cisco 7206 has six slots (slots 1 to 6) for the port adapters, one slot for an Input/Output (I/O) controller, and one slot for a network processing engine (NPE). You can place port adapters in any of the six available slots.

The front of the Cisco 7206 provides access to an I/O controller and up to six network interface port adapters. The I/O controller contains the following:

- Local console port for connecting a data terminal or data terminal equipment (DTE) and an auxiliary port for connecting a modem or other data communications equipment (DCE) or other devices for configuring and managing the router
- Two personal computer memory card international association (PCMCIA) slots for Flash memory cards
- Optional Fast Ethernet port, which provides a 100-Mbps connection to the network

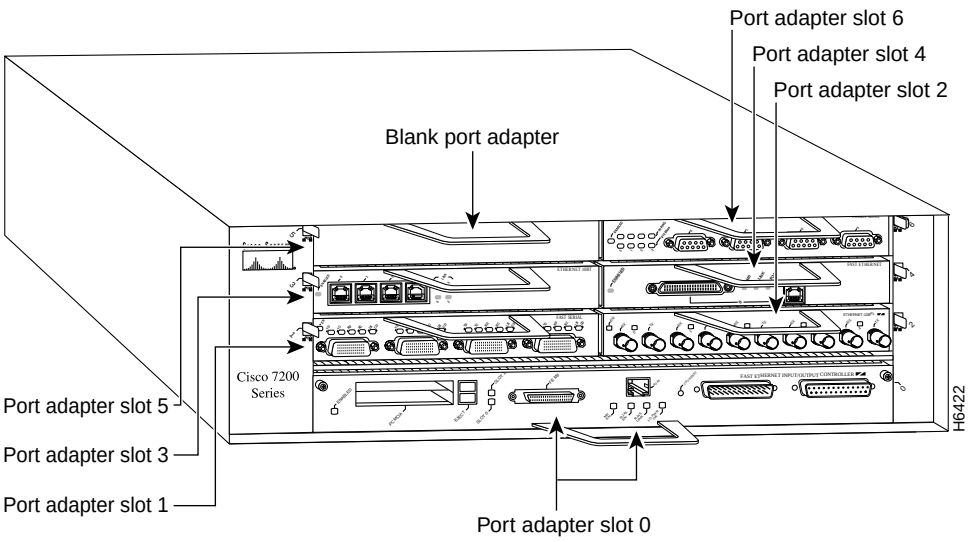
Note The I/O controller is available with or without a Fast Ethernet port. The I/O controller with a Fast Ethernet port is equipped with both a media-independent interface (MII) receptacle and an RJ-45 receptacle; however, only one of these two receptacles can be used at a time.

The port adapters installed in the Cisco 7206 router are of the same type as those installed on the second-generation Versatile Interface Processors (VIP2s) in the Cisco 7500 series routers, in Cisco 7000 series routers using the Cisco 7000 series Route Switch Processor (RSP7000) and Cisco 7000 series Chassis Interface (RSP7000CI), and in the Cisco uBR7246 universal broadband router. The port adapters installed in the Cisco 7206 support OIR. For an explanation of OIR, see the "Online Insertion and Removal" section on page 1-43.

Note The I/O controller does not support OIR. You must power down the Cisco 7206 before removing the I/O controller from either router shelf.

Port adapter slots in the Cisco 7206 routers are numbered from left to right from the bottom up, beginning with port adapter slot 1 and continuing through port adapter slot 6. Port adapter slot 0 is the Fast Ethernet port on the I/O controller. (See Figure 1-20.)

Figure 1-20 Port Adapter Slot Numbering



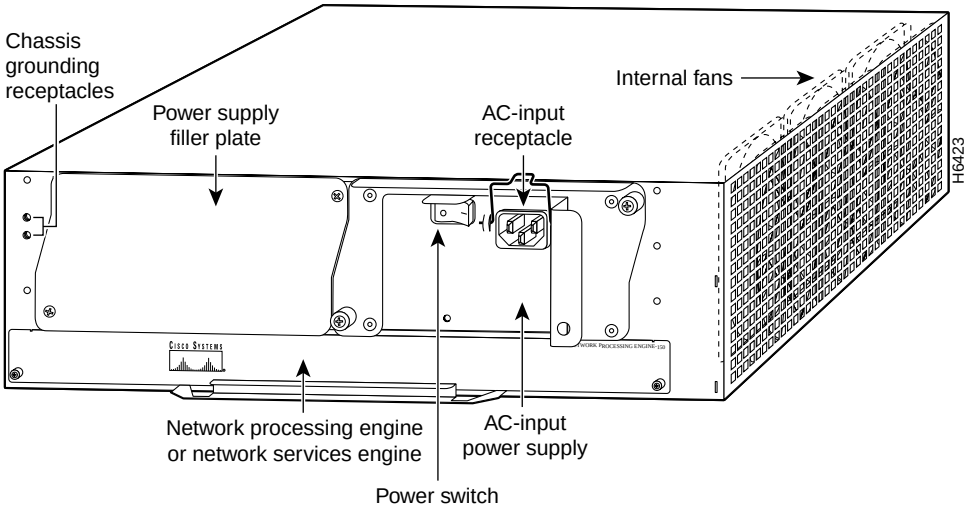
Power Supplies

The Cisco 7206 router is equipped with one 280W AC-input or one 280W DC-input power supply. A fully configured Cisco 7206 router operates with only one installed power supply; however, a second, optional power supply of the same type provides hot-swappable, load-sharing, redundant power. Figure 1-21 shows the rear of a Cisco 7206 router configured with a single AC-input power supply. (A power supply filler plate is installed over the second power supply bay.)

Caution Do not mix power supplies in the Cisco 7206. In dual power supply router configurations, both power supplies must be of the same type (two AC-input power supplies or two DC-input power supplies).

The power supply has the router's main power switch and either an AC-input power receptacle or a hardwired DC-input power cable (depending on the type of installed power supply). The rear of the Cisco 7206 router provides access to the network processing engine and the power supplies. Adjacent to the power supply bays are two chassis ground receptacles that provide a chassis ground connection for ESD equipment or a two-hole grounding lug. (See Figure 1-21.)

Figure 1-21 Cisco 7206 Router—Rear View



Three internal fans draw cooling air into chassis and across internal components to maintain an acceptable operating temperature. The three fans are enclosed in a tray that is located in the subchassis.

Caution To ensure the proper flow of cooling air across the internal components, make sure blank port adapters are installed in all unoccupied port adapter slots and power supply filler plates are installed in unoccupied power supply bays.

Network Processing Engine

The network processing engine has no external connectors or LEDs. There is a handle for removing and installing the network processing engine and two captive screws for securing it to the chassis.

Note The network processing engine does not support OIR. You must power down the Cisco 7206 before removing the network processing engine from the router.

The Midplane

The I/O controller, port adapters, power supplies, and network processing engine slide into their respective chassis slots and connect directly to the router's midplane; there are no internal cables to connect. The midplane distributes DC power from the power supplies to the I/O controller, port adapters, fan tray, and network processing engine.

The midplane also identifies OIR of the port adapters, bridges the PCI buses from the port adapters to packet static random-access memory (SRAM) on the network processing engine, arbitrates traffic across the PCI buses, and generates the clock signals for the port adapters on each PCI bus.

Rack-Mount Kit

A rack-mount kit is included with all Cisco 7206 routers when they are shipped from the factory. The kit provides the hardware needed to mount the router in a standard 19-in. equipment rack or a telco rack. The steps for installing a Cisco 7206 router in an equipment rack are explained in the *Cisco 7206 Installation and Configuration Guide* (Document Number DOC-7206-ICG=).

A fully configured Cisco 7206, with two installed power supplies and all chassis slots filled, weighs approximately 50 lb (22.7 kg). For clearance requirements and rack-mount installation considerations, refer to the *Cisco 7206 Installation and Configuration Guide* (Document Number DOC-7206-ICG=).

Field-Replaceable Units

The Cisco 7206 router is easy to service; all its major components are FRUs. Instructions for removing and replacing individual FRUs are contained in separate documents, called configuration notes, which accompany every FRU shipped from the factory. The configuration notes are also available on the Documentation CD-ROM and on Cisco Connection Online (CCO).

The following Cisco 7206 components are FRUs:

- Network processing engine

  Detailed instructions for removing and replacing the network processing engine are contained in *Network Processing Engine Replacement Instructions* (Part Number 78-3225-xx).

- Input/Output controller

  Detailed instructions for removing and replacing the I/O controller are contained in *Input/Output Controller Replacement Instructions* (Part Number 78-3224-xx).

- Port adapters

  The Cisco 7206 is shipped from the factory with up to six installed port adapters that provide a variety of network media types (based on your order). The port adapters connect directly to the router's midplane. Port adapters installed in the Cisco 7206 router support OIR.

  Detailed instructions for removing, replacing, and configuring the port adapter types supported by the Cisco 7206 are contained in the configuration note for that port adapter. For example, if you plan to replace a four-port, half-duplex Token Ring port adapter in your Cisco 7206 router, refer to *PA-4R Token Ring Port Adapter Installation and Configuration* (Part Number 78-2661-xx).

  For general instructions about how to remove and replace a port adapter, refer to the *Cisco 7206 Installation and Configuration Guide* (Document Number DOC-7206-ICG=).

- Power supplies

  Detailed instructions for removing and replacing the Cisco 7206 power supplies are contained in *280-Watt AC-Input Power Supply Replacement Instructions* (Part Number 78-3227-xx) and *280-Watt DC-Input Power Supply Replacement Instructions* (Part Number 78-3420-xx).

- Fan tray

  Detailed instructions for removing and replacing the fan tray are contained in *Subchassis and Fan Tray Replacement Instructions* (Part Number 78-3228-xx).

- Subchassis (including the midplane)

  Detailed instructions for removing and replacing the subchassis are contained in *Subchassis and Fan Tray Replacement Instructions* (Part Number 78-3228-xx).

- Chassis

  To replace the chassis you must remove all internal components. When replacing the chassis, refer to the individual configuration notes that explain how to remove and replace each internal component.

- Flash memory cards

  Detailed instructions for removing and replacing Flash memory cards and SIMMs are contained in the configuration note *Memory Replacement Instructions for the Network Processing Engine and Input/Output Controller* (Part Number 78-3226-xx).

  Instructions for installing and removing a Flash memory card are also contained in the *Cisco 7206 Installation and Configuration Guide* (Document Number DOC-7206-ICG=).

- Rack-mount kit and cable-management brackets

  Detailed instructions for installing the rack-mount and cable-management brackets on your Cisco 7206,are contained in the *Cisco 7206 Installation and Configuration Guide* (Document Number DOC-7206-ICG=).

Dial Shelf Interconnect Port Adapter

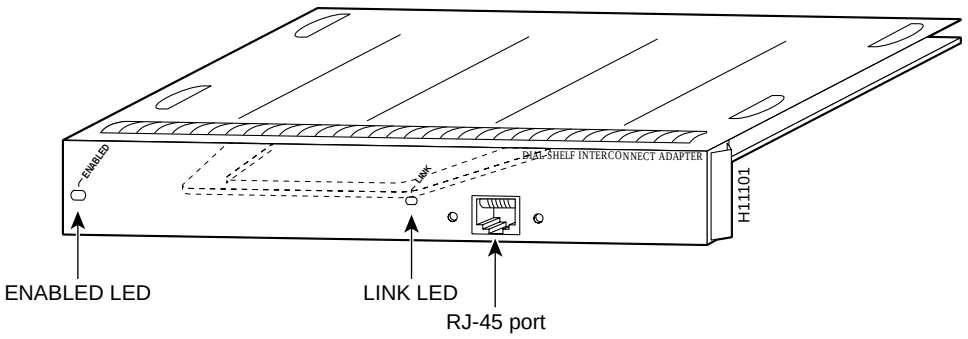
The Cisco AS5800 includes a dial shelf interconnect port adapter that connects the Cisco 5814 dial shelf to the Cisco 7206 router shelf. The interconnect port adapter installs in any 7206 router shelf port adapter slot and connects directly to the dial shelf controller card on the dial shelf using a single full-duplex cable.

The interconnect port adapter allows data transfers between the dial shelf and the router shelf. Data is converted into packets by the dial shelf cards, transmitted to a hub on the dial shelf controller card, and sent to the router shelf from there. Conversely, packets from the router shelf are sent to the dial shelf controller card, where they are transmitted over the backplane to the modem and trunk cards.

LED Indicators

The dial shelf interconnect port adapter contains two LEDs: an enabled LED and a link status LED, shown in Figure 1-22. After system initialization, the enabled LED lights to indicate that the dial shelf interconnect port adapter has been enabled for operation.

Figure 1-22 Dial Shelf Interconnect Port Adapter Front Panel



The following conditions must be met before the dial shelf interconnect port adapter is enabled:

- The dial shelf interconnect port adapter is correctly connected to the router shelf midplane and receiving power.
- A valid Cisco IOS software image for the adapter has been downloaded successfully.
- The system recognizes the adapter.

If any of the above conditions are not met, or initialization fails for other reasons, the enabled LED remains off.

The link LED indicates an active connection to the dial shelf. This LED lights when the dial shelf interconnect port adapter is receiving a carrier signal from the dial shelf.

Software and Hardware Requirements

The dial shelf interconnect port adapter requires that the host Cisco 7206 router shelf is running Cisco IOS Release 11.3(2) AA or later.

Note IOS release 11.3 (5.1) AA or later is required to support two dial shelf interconnect port adapters. Two dial shelf interconnect port adapters are required to support dual dial shelf controllers.

Port adapters are rated by data-carrying capacity as high, medium, or low bandwidth. The host Cisco 7206 router shelf has certain data carrying capacity (or bandwidth) restrictions that affect the number of high bandwidth port adapters you can install. The dial shelf interconnect port adapter is considered to be high bandwidth. Refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines* document that shipped with your Cisco 7206 router shelf for more information on port adapter installation restrictions.

Split Dial Shelves

The split dial shelf configuration of the Cisco AS5800 dial platform increases bandwidth by using two Cisco 7206 router shelves to service a single Cisco 5814 dial shelf. The dual router shelves serve as the interfaces between the split Cisco 5814 dial shelf and the external network. This configuration provides the equivalent of two Cisco AS5800s in a single rack. Split dial shelf configuration requires two DSC cards and two Cisco 7206 router shelves (both with dial shelf interconnect port adapters). For more information on hardware and software configuration needed for a split dial shelf configuration, refer to the *Cisco AS5800 Universal Access Server Split Dial Shelf Installation and Configuration* document or the *Cisco AS5800 Universal Access Server Operations, Administration, Maintenance, and Provisioning Guide*, available soon.

Power Requirements

The Cisco AS5800 ships configured for either AC-input or DC-input power with loadsharing, depending on your order.

AC-Input Power Shelf

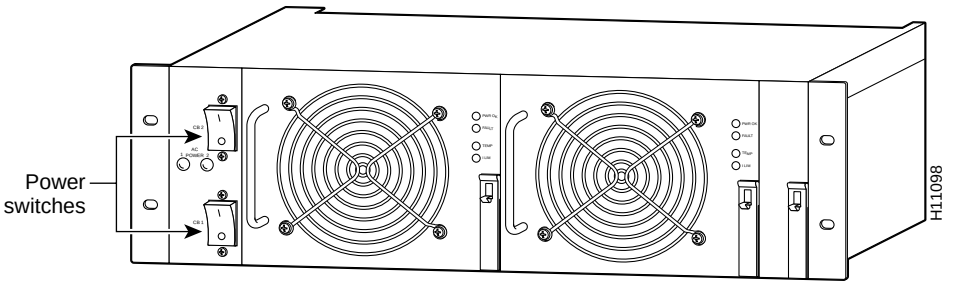
The AC-input power shelf includes two 2,000W AC-input power supplies that plug into a common power backplane in the AC-input power shelf. A single AC-input power supply is capable of powering a fully configured Cisco 5814 dial shelf. A second power supply provides full redundancy.

During normal operation, the dual AC-input power supplies provide automatic loadsharing, with each power supply supporting 50 percent of the power load. When you remove one of the AC-input power supplies, the remaining power supply immediately ramps up to full power and maintains uninterrupted system power.

Note The AC-input power supplies are "hot-swappable," allowing you to remove or replace a power supply while the system is operating; system operation is not affected. Whenever possible, we recommend that you connect each AC-input power supply to a separate AC power source.

Each AC-input power supply is powered ON by a separate power switch, which is located on the AC-input power shelf front panel. (See Figure 1-23.) Ejector levers with locking spring clips secure each power supply to the backplane connectors, and a handle on each power supply allows you to remove and replace the power supplies with ease.

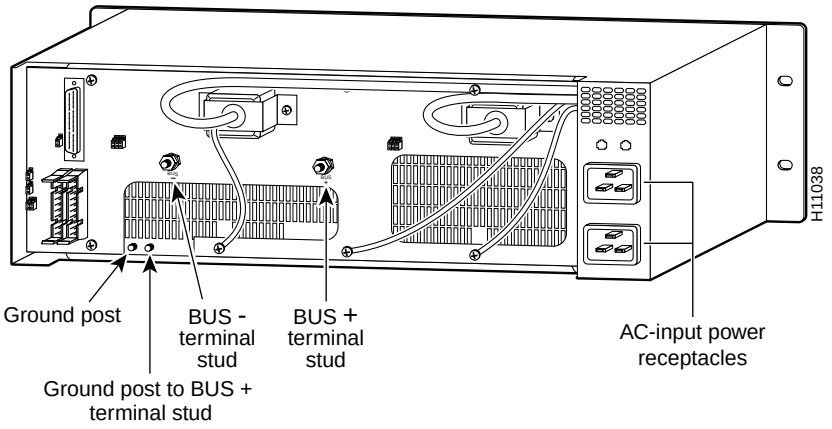
Figure 1-23 Cisco AS5800 Standard AC-Input Power Shelf—Front View



The AC-input power shelf is three rack units high [5.25 in. (13.32 cm)], and mounts underneath the dial shelf in a standard 19-in. 4-post or telco-type rack assembly. Note the rack placement of the AC-input power shelf in Figure 1-1.

All cable connections for AC-input power, DC-output power, and status signals are made from the AC-input power shelf rear. (See Figure 1-24.) Two modular power cables connect each AC-input power supply to the site AC-input power source. Two DC-interconnect cables provide DC-output power to the dial shelf. A monitor cable provides a status signal connection to the dial shelf filter module MBus, which monitors voltage tolerance levels, temperature conditions, and power failure in the AC-input power shelf. A grounding cable provides a ground connections from the AC-input power shelf to the dial shelf.

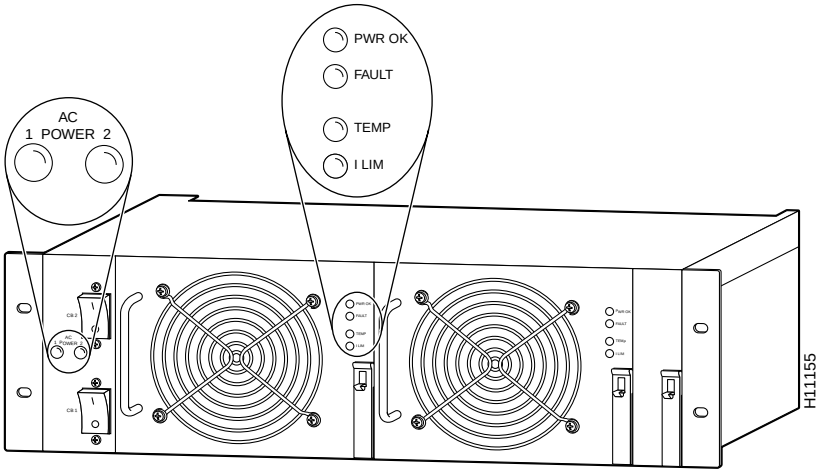
Figure 1-24 Cisco AS5800 Standard AC-Input Power Shelf—Rear View



Standard AC-Input Power Shelf LED Indicators

The standard AC-input power shelf includes two LEDs that are located on the left front of the power shelf and four LEDs that are located on the front of each power supply. (See Figure 1-25.)

Figure 1-25 Standard AC-Input Power Supply LEDs



The standard AC-input power supply LEDs are summarized in Table 1-9.

Table 1-9 Standard AC-Input Power Supply LEDs

LED	Color	Description
AC POWER 1 & 2	Green	Correspond to each power supply and are on when AC power is present.
PWR OK	Green	On when the power supply is connected, powered on, and receiving power. **Note** For full redundancy, all PWR OK and AC POWER LEDs on the power shelf and each power supply should be on.
FAULT	Yellow	Lights when the power shelf has detected an internal fault.

Table 1-9 Standard AC-Input Power Supply LEDs (continued)

LED	Color	Description
TEMP	Yellow	Lights when the power shelf has shut down because of overtemperature conditions.
I LIM	Yellow	Lights when the power shelf is overloaded and operating in a current-limiting state. The current limit LED lights for either of the following reasons: • The power supply is operating in a current overload condition, such that the voltage is drawn below the fault threshold level. • The power shuts down due to an overcurrent condition in the power supply. (When this occurs, both the I LIM LED and the Fault LED light.)

DC-Input Power Specifications

The PEMs provide –48 VDC power, which is distributed from the filter module to the dial shelf backplane. The analog isolators in the filter module are provided with 15 VDC. No damage will come to the PEMs if any or all outputs have no load (no load occurs when there are no cards plugged into the backplane) or if the maximum input voltage is exceeded; however, input voltages that exceed 75V will eventually trip the PEM 60A circuit breaker, and you may have to reset the breaker.

The Cisco AS5800 supports several types of logic cards with varying power requirements. As a result, each logic card DC-to-DC converter system is isolated from the distributed –48 VDC power, creating a more stable distributed power system.

AC-Input Power Specifications

The Cisco AS5800 accepts AC-input power using a separate, self-contained AC-input power shelf, which converts AC-input power into DC output for use by the DC-powered dial shelf. The AC-input power shelf is rack mounted and has a safety cover that shields the electrical connections in the power shelf rear.

The AC-input to DC-output connection supplies –48 VDC-output power to the dial shelf PEMs. The PEMs receive the –48V and transmit power to the filter module. Power flows through the filter module to the backplane, where it is distributed to the dial shelf controller card and dial shelf cards.

The AC-input power shelf includes two 2,000W AC-input power supplies that plug into a common power backplane in the AC-input power shelf. A single AC-input power supply is capable of powering a fully configured Cisco 5814 dial shelf. The second power supply provides full redundancy.

During normal operation, the dual AC-input power supplies provide automatic loadsharing, with each power supply supporting 50 percent of the power load. When you remove one of the AC-input power supplies, the remaining power supply immediately ramps up to full power and maintains uninterrupted system power.

The AC-input power supplies are “hot-swappable,” allowing you to remove or replace a power supply while the system is operating; system operation is not affected. Whenever possible, we recommend that you connect each AC-input power supply to a separate AC power source.

Each AC-input power supply is powered on by a separate power switch, which is located on the AC-input power shelf front panel. (See Figure 1-23.) Ejector levers with locking spring clips secure each power supply to the backplane connectors, and a handle on each power supply allows you to remove and replace the power supplies with ease.

The AC-input power shelf is three rack-units high (5.25 in. [13.3 cm]) and rack-mounts in a standard 19-in., 4-post or telco rack assembly, one rack unit below the dial shelf.

All cable connections for AC-input power, DC-output power, and status signals are made from the AC-input power shelf rear. (See Figure 1-24.) Two modular power cables connect each AC-input power supply to the site's AC-input power source. Two DC-interconnect cables provide DC-output power to the dial shelf. A monitor cable provides a status signal connection to the dial shelf filter module MBus, which monitors voltage tolerance levels, temperature conditions, and power failure in the AC-input power shelf. A grounding cable provides a ground from the AC-input power shelf to the dial shelf.

For detailed specification tables, refer to Appendix A, "Cisco AS5800 Specifications."

Enhanced AC-Input Power Shelf

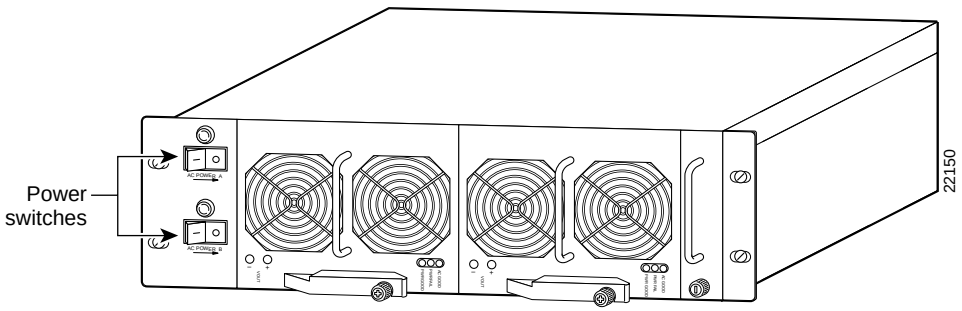
The enhanced AC-input power shelf includes two 2,000-watt (W) AC-input power supplies that plug into a common power backplane in the enhanced AC-input power shelf. A single AC-input power supply is capable of powering a fully configured Cisco 5814 dial shelf. A second power supply provides full redundancy.

During normal operation, the dual AC-input power supplies provide automatic load-sharing, with each power supply supporting 50 percent of the power load. When you remove one of the AC-input power supplies, the remaining power supply immediately ramps up to full power and maintains uninterrupted system power.

Note The AC-input power supplies in the enhanced AC-input power shelf are "hot-swappable," allowing you to remove or replace a power supply while the system is operating; system operation will not be affected. Whenever possible, we recommend that you connect each AC-input power supply to a separate AC power source.

Each AC-input power supply is powered ON by a separate power switch, which is located on the enhanced AC-input power shelf front panel (Figure 1-23). Ejector levers with locking spring clips secure each power supply to the backplane connectors, and a handle on each power supply allows you to remove and replace the power supplies with ease.

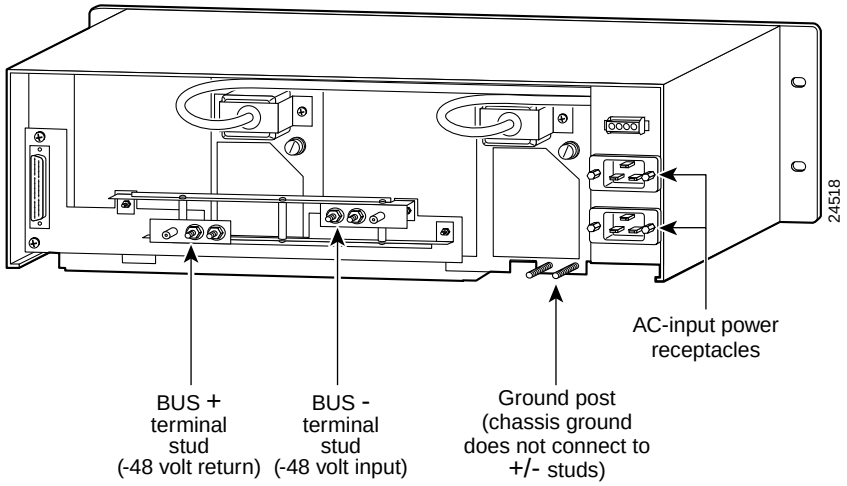
Figure 1-26 Cisco AS5800 Enhanced AC-Input Power Shelf—Front View



The enhanced AC-input power shelf is three rack units high [5.25 in. (13.32 cm)], and mounts underneath the dial shelf in a standard 19-in., 4-post or telco-type rack assembly.

All cable connections for AC-input power, DC-output power, and status signals are made from the enhanced AC-input power shelf rear. (See Figure 1-27.) Two modular power cables connect each AC-input power supply to the site AC-input power source. Two DC-interconnect cables provide DC-output power to the dial shelf. A monitor cable provides a status signal connection to the dial shelf filter module maintenance bus (MBus), that monitors voltage tolerance levels, temperature conditions, and power failure in the enhanced AC-input power shelf. A grounding cable provides a ground connection from the enhanced AC-input power shelf to the dial shelf.

Figure 1-27 Cisco AS5800 Enhanced AC-Input Power Shelf—Rear View



For detailed specification tables, refer to Appendix A, “Cisco AS5800 Specifications.”

Online Insertion and Removal

The Cisco AS5800 supports online insertion and removal (OIR), which allows you to remove and replace a dial shelf card while the system is operating, without affecting system operation.

Caution In order to maintain traffic flow in a single dial shelf controller (DSC) configuration, the DSC shouldn’t be removed while the system is operational. If the DSC is removed, the interconnect link between the DSC and router shelf will be lost and all other dial shelf cards will go down. The router console port will display the following message:

```
AUG 2 10:57:02.017 CST: %DSC_REDUNDANCY-3-BICLINK: Link to active DSC down
```

Note This section describes the mechanical functions of the system components and emphasizes the importance of following the correct procedures to avoid unnecessary circuit board failures. This section is for background information only.

Each DSC card and dial shelf card contains female connectors that connect to the system backplane. Each male backplane connector comprises a set of tiered pins in three lengths. The backplane pins send specific signals to the system as they make contact with the card connectors. The system assesses the signals it receives and the order in which it receives them to determine whether to initialize a startup or shutdown procedure.

Each DSC card and dial shelf card is designed with two ejector levers to be used when you install or remove a card. The function of the ejector levers (see Figure 2-5) is to align and securely seat the card connectors in the backplane and facilitate the installation and removal process.

Do not force the DSC cards or dial shelf cards into the slot, because this can damage the card connector pins if they are not aligned properly with the card connectors.

To avoid erroneous failure messages, you must allow at least 15 sec for the system to reinitialize and note current interface configurations before you remove or insert another DSC card or dial shelf card in the dial shelf.

Preparing for Installation

This chapter describes the equipment and site requirements for installing the Cisco AS5800. Before installing your access server, you should consider the power and cabling that must be in place at your installation site, the equipment needed for installation, and the environmental conditions your installation site must meet to maintain normal operation. This chapter guides you through the installation preparation process.

Warning Only trained and qualified personnel should be allowed to install or replace this equipment. To see translations of the warnings that appear in this publication, refer to the *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information* document that accompanied this device.

Site Requirements

The Cisco AS5800 is designed with an environmental monitoring system that protects the system and components from potential damage from overvoltage and overtemperature conditions. To assure normal operation and avoid unnecessary maintenance, plan your site configuration and prepare your site *before* installation. After installation, make sure that the site maintains an ambient temperature of 32° F through 104° F (0° C through 40° C), and keep the area around the chassis as free from dust as is practical.

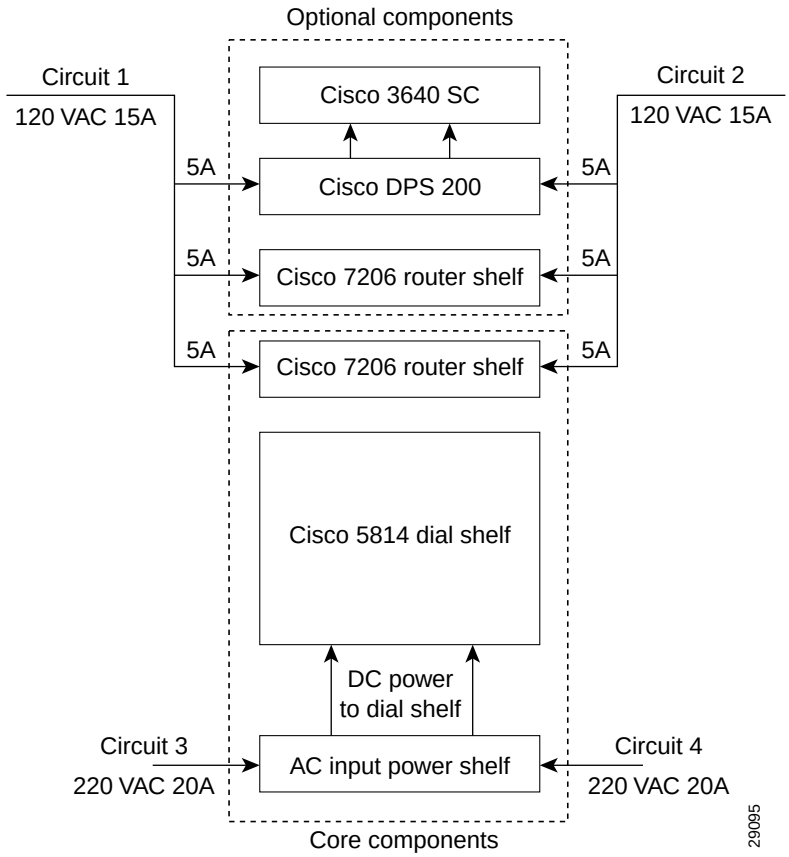
The following sections address the site environment requirements for the access server.

AC and DC Power

The Cisco 5814 dial shelf and Cisco 7206 router shelf are designed to support either AC-input or DC-input power.

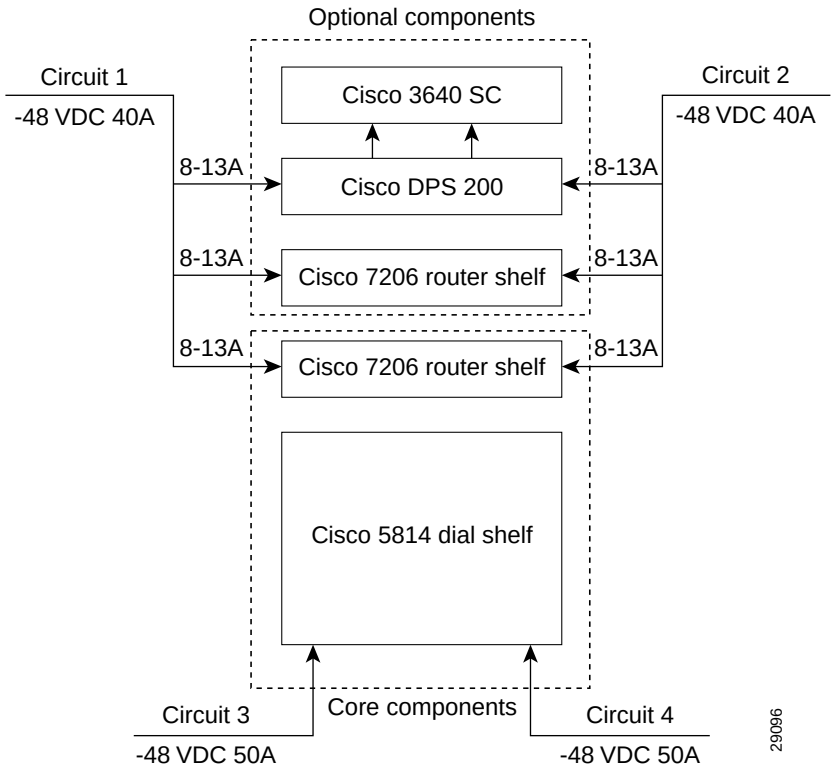
Caution Never use an AC-input router shelf with a DC-input dial shelf, or the reverse.

Figure 2-1 AC Power Planning



If AC power will be used, to provide full redundancy the Cisco AS5800 requires two 220 VAC 30A circuits for the Cisco 5814 dial shelf and its components, and two additional120 VAC 15A circuits for the Cisco 7206 router shelf (or shelves, if a split dial shelf configuration will be used) and the Cisco 3640 system controller (if used). See Figure 2-1.

Figure 2-2 DC Power Planning



If DC power will be used, to provide full redundancy the Cisco AS5800 requires two DC power circuits providing up to 54A at -48VDC for theCisco 5814 dial shelf and its components, and two additional 40A -48VDC circuits for the router shelf (or shelves, if a split dial shelf configuration will be used) and the Cisco 3640 system controller (if used). See Figure 2-2.

Cisco 5814 Dial Shelf

The Cisco 5814 dial shelf can be ordered with DC-input power supplies only, or with the addition of an optional AC-input power shelf.

- The DC-input power supplies allow the access server to operate at –48 VDC nominal in North America and –60 VDC in Europe.
- The AC-input power supplies operate between 200 and 240 VAC input voltage and supply –48 VDC power to the dial shelf DC power-entry modules.

Note The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Typically, green or green/yellow is used for ground, black is used for +48V Return, and red or white is used for -48V. Make certain that the lead color coding you choose for the DC-input power supply matches lead color-coding used at the DC power source.

For detailed system and cabling specification tables, refer to Appendix A, “Cisco AS5800 Specifications.”

Cisco 7206 Router Shelf

The Cisco 7206 router shelf can be ordered with either 280W AC-input or 280W DC-input power supplies.

- The AC-input power supply uses a power factor corrector that allows the Cisco 7206 router shelf to operate on input voltage and frequency within the ranges of 100 to 240 VAC and 50/60 Hz.
- Each AC-input power supply operating at 120 VAC requires a minimum of 5A service. We recommend powering the Cisco 7206 router shelf from a 15A receptacle at the power source.

  For more information on Cisco 7206 router shelf AC-input power, refer to the document *Cisco 7200 Series 280-Watt AC-Input Power Supply Replacement Instructions* (Part Number 78-3227-xx) that shipped with your Cisco 7206 router shelf.
- The DC-input power supply operates at –48 VDC input voltage and supplies +5V, +12V, –12V, and +3V DC power to the router shelf internal components through the router midplane.
- Each DC-input power supply operating at –48 VDC in North America requires a minimum of 14A service. Each DC-input power supply operating at –60 VDC in the European Community requires a minimum of 8A service. We recommend powering the Cisco 7206 router shelf from a 15A receptacle at the power source.

  For more information on Cisco 7206 router shelf DC-input power, refer to the document *Cisco 7200 Series 280-Watt DC-Input Power Supply Replacement Instructions* (Part Number 78-3420-xx) that shipped with your Cisco 7206 router shelf.

Note We recommend attaching dual power supplies to independent power sources for full redundancy. We also recommend an uninterruptable power source to protect against power failures at your site. Each AC-input power supply operating at 200 VAC requires a minimum of 20A service. We recommend powering the Cisco AS5800 from a 20A, 200 to 240 VAC receptacle at the power source.

Lifting Safety

Caution A fully configured dial shelf weighs approximately 278 lb (126.1 kg). The chassis is not intended to be moved frequently. Before you install the dial shelf, ensure that your site has the desired power sources and network connections so that you can avoid having to move the chassis. (See the “Site Specifications” section on page 2-20 for other site requirement guidelines.)

Caution If you will be installing the dial shelf without using a forklift or other mechanical lifting device, you must first remove the blower assembly, the dial shelf cards, the DC PEMs, and the dial shelf controller cards from the chassis and have two people help you with the dial shelf installation. The 5814 dial shelf weighs 114 lb. when these FRUs are removed. The instructions contained in this document are for installing the Cisco 5814 in a rack without using a forklift. Plan on having at least two people available to help lift the units into place to rack mount them, and another person to attach the mounting bolts. Ensure that there is enough room for the installers to move around all four sides of the rack comfortably.

Warning Two people are required to lift the chassis. Use the handles on the chassis sides. To prevent injury, keep your back straight and lift with your legs, not your back. To prevent damage to the chassis and components, never attempt to lift the chassis with the handles on the power supplies, the filter module, or on the blower assembly. These handles are not designed to support the weight of the chassis. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Note You may have to lift the chassis gripping the chassis itself using the spaces provided by the removed DC PEMs and blower assembly.

Whenever you lift any heavy components manually, follow these guidelines:

- Always have a second person available to help lift the component; never lift the component alone.
- Ensure that your footing is solid and balance the weight of the object between your feet.
- Lift the chassis slowly; never move suddenly or twist your body as you lift.
- Keep your back straight and lift with your legs, not your back. If you must bend down to lift the assembly, bend at the knees, not at the waist, to reduce the strain on your lower back muscles.

Note Consider the total weight of the system to be lifted and calculate at least one person for every 60 lb of weight.

Required Tools and Equipment

You need the following items to install the access server:

- ESD-preventive wrist strap
- Antistatic mat
- No. 2 Phillips screwdriver
- 1/4-in. flat-blade screwdriver
- 3/16-in. flat-blade screwdriver (for split dial shelf configurations)
- Tape measure (optional)
- Level (optional)
- *Cisco 7206 Installation and Configuration Guide* for installing the router shelf
- *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide*

  The *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* will be replaced by the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide*, available later this year.

The rack-mount kit includes the following parts:

- Six rack-mount brackets for mounting the dial shelf in the rack
- Two support brackets
- A total of 12 M5 x 10-mm Phillips flathead screws to secure the rack-mount brackets to the dial shelf
- A total of 16 slotted 10-32 x 3/8 screws for rack installation

In addition, you might need the following external equipment, especially when installing a split dial shelf configuration:

- Data service unit (DSU) to connect each serial port to an external network
- A serial port adapter cable for each serial port to connect the port with a remote device or network
- T1 channel service unit/data service unit (CSU/DSU) that converts the HDLC synchronous serial data stream into a T1 data stream with the correct framing and ones density to connect. Some telephone systems require a minimum number of 1 bit per time unit in a data stream, called *ones density*, to connect a serial port to a T1 network. Several T1 CSU/DSU devices are available as additional equipment, and most provide either a V.35, EIA/TIA-449, or EIA-530 electrical interface.
- Ethernet transceiver
- Token Ring media attachment unit (MAU)
- Optical bypass switch or concentrator for multimode Fiber Distributed Data Interface (FDDI) connections

Preparing the Dial Shelf for Rack-Mount

The Cisco 5814 dial shelf is shipped with the blower assembly and all dial shelf cards (trunk and modem cards) and dial shelf controller cards installed in the chassis. Fully loaded, the dial shelf weighs 278 lb (126.1 kg).

Before installing the Cisco 5814 in an equipment rack, we recommend that you remove the blower assembly, DC PEMs, dial shelf cards, and dial shelf controller cards from the dial shelf, then reinstall them after the dial shelf is mounted in the rack. (If you are using a forklift or other machinery to lift the dial shelf, you might want to omit this process.)

After you remove the blower assembly, PEMs, and the installed cards, you will mount the rack-mount brackets on the dial shelf chassis and install the dial shelf in the rack.

Removing the Blower Assembly

Caution The blower assembly weighs 27.5 lb (12.5 kg). Use two hands when removing or replacing the blower assembly.

To remove the blower assembly, complete the following steps:

Step 1 Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.

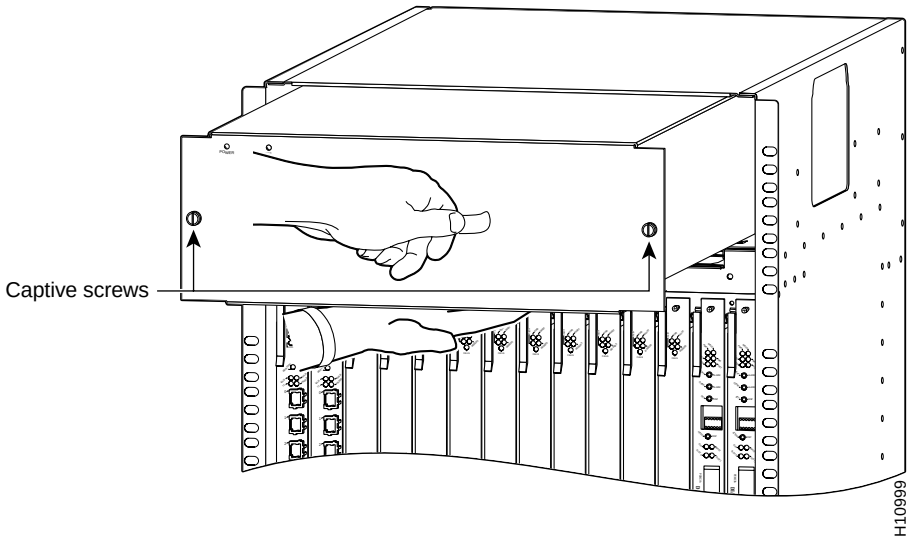
Step 2 Loosen the two captive screws on the blower assembly front panel. (See Figure 2-3.)

Step 3 Grasp the blower assembly handle with one hand and pull the blower assembly straight toward you, about halfway out of the slot. (See Figure 2-3.)

Step 4 Place your other hand under the blower assembly as it extends from the dial shelf chassis.

Step 5 Slowly pull the blower assembly all the way out of the slot and set it aside until you are ready to reinstall it.

Figure 2-3 Removing the Blower Assembly



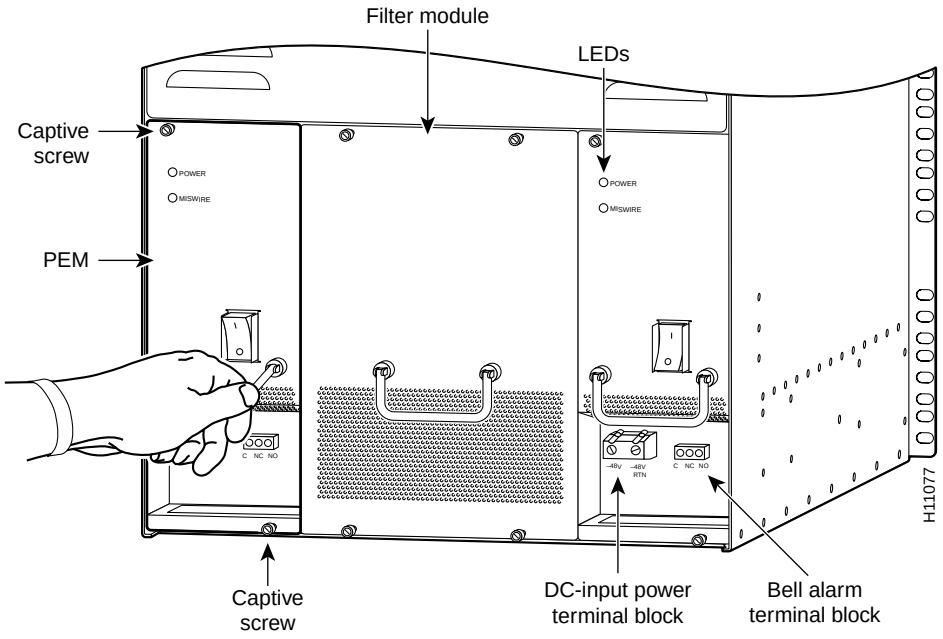
Removing the DC Power-Entry Modules

To remove the DC PEMs, complete the following steps:

Step 1 Using a 1/4-inch flat-blade screwdriver, loosen the captive screws on the PEM front panel.

Step 2 Grasp the handle and carefully pull the PEM from the backplane connectors using a gentle rocking motion; then remove the PEM from the DC power supply chassis. (See Figure 2-4.)

Figure 2-4 Removing and Replacing a PEM



Step 3 Repeat Step 1 and Step 2 for the other PEM.

This completes the PEM removal process. Proceed to “Removing Dial Shelf Cards and Dial Shelf Controller Cards.”

Removing Dial Shelf Cards and Dial Shelf Controller Cards

To remove the dial shelf cards and dial shelf controller cards, follow these steps:

Caution Trunk cards and modem cards weigh 8 lb (3.3 kg) each. Dial shelf controller cards weigh 8.5 lb (3.8 kg) each. Use two hands when removing or replacing cards in the dial shelf.

Step 1 Record the original position of each card before you remove the cards from the dial shelf slots. Refer to this information when you reinstall the cards.

Step 2 Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.

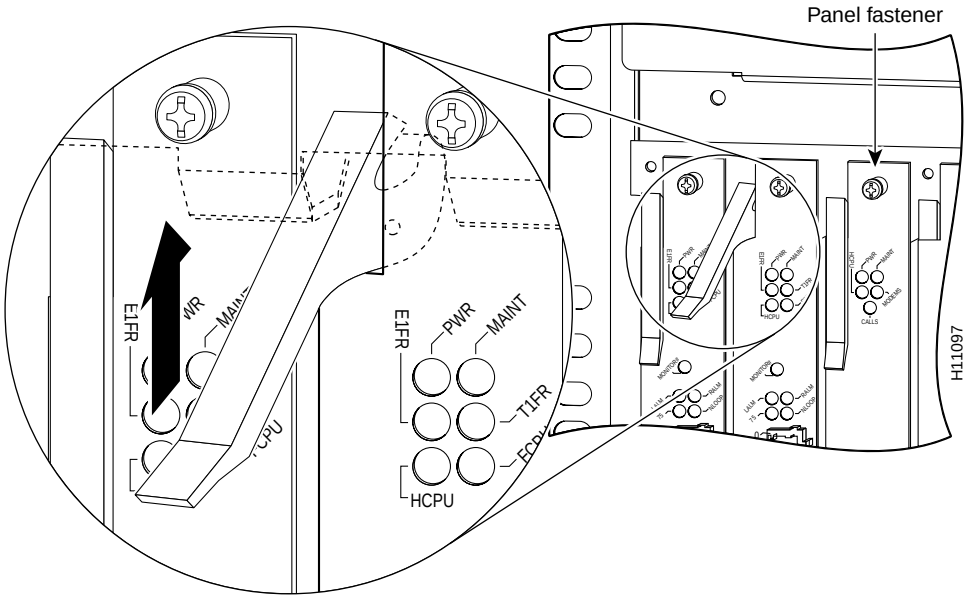
Caution To prevent ESD damage, handle trunk cards by ejector levers and carrier edges only, and use an ESD-preventive wrist strap or other grounding device.

Step 3 Using a No. 2 Phillips screwdriver, loosen the panel fasteners at the top and bottom of the card front panel.

Step 4 Pull either the upper or lower ejector lever away from the card front panel to disengage the card from the backplane connector. (See Figure 2-5.)

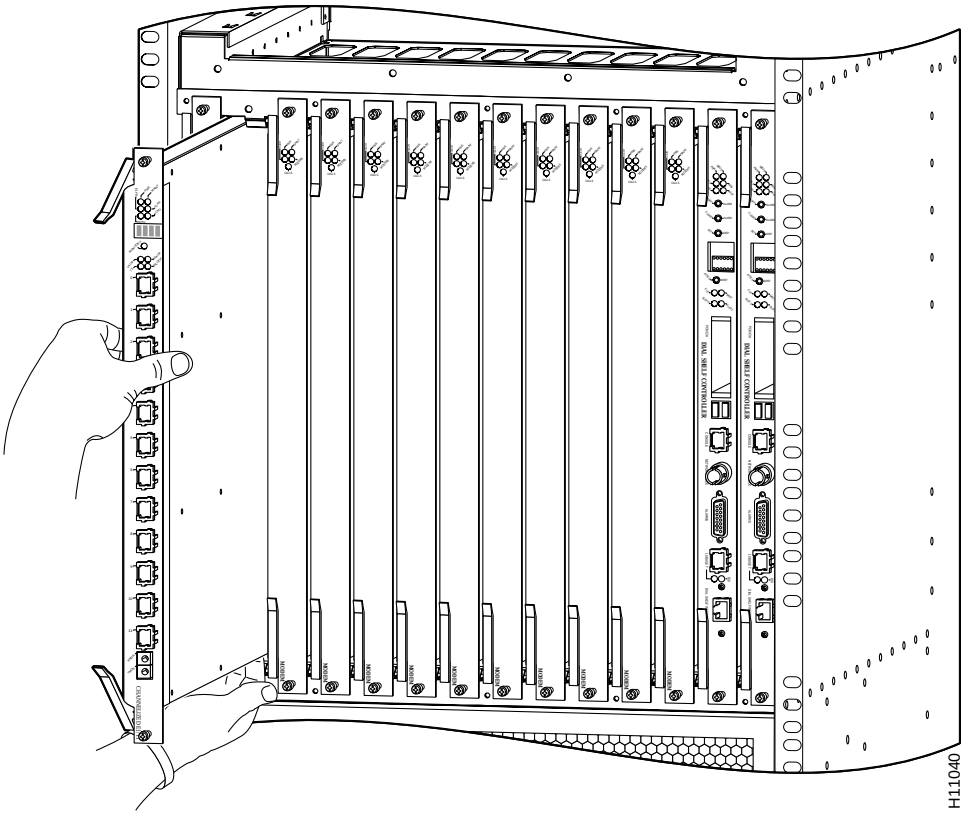
Caution Always use the ejector levers when disengaging or seating trunk cards, modem cards, or dial shelf controller cards in the dial shelf backplane. Failure to do so can cause erroneous system error messages indicating a card failure. However, do *not* use the ejector levers to lift or support the weight of the cards.

Figure 2-5 Using the Ejector Levers



Step 5 Grasp the ejector levers and pull the card partially out of the dial shelf slot until you can grasp the card front panel with one hand. Place your other hand under the card to balance the weight of the card as you pull it out of the slot. (See Figure 2-6.)

Figure 2-6 Removing Dial Shelf Cards and Dial Shelf Controller Cards



Step 6 Pull the card straight out of the slot. Avoid touching the circuitry or any connector pins.

Step 7 Place the removed card on an antistatic mat or foam pad until you are ready to reinstall it in the chassis.

Step 8 Repeat Step 3 through Step 7 for all remaining cards in the dial shelf chassis.

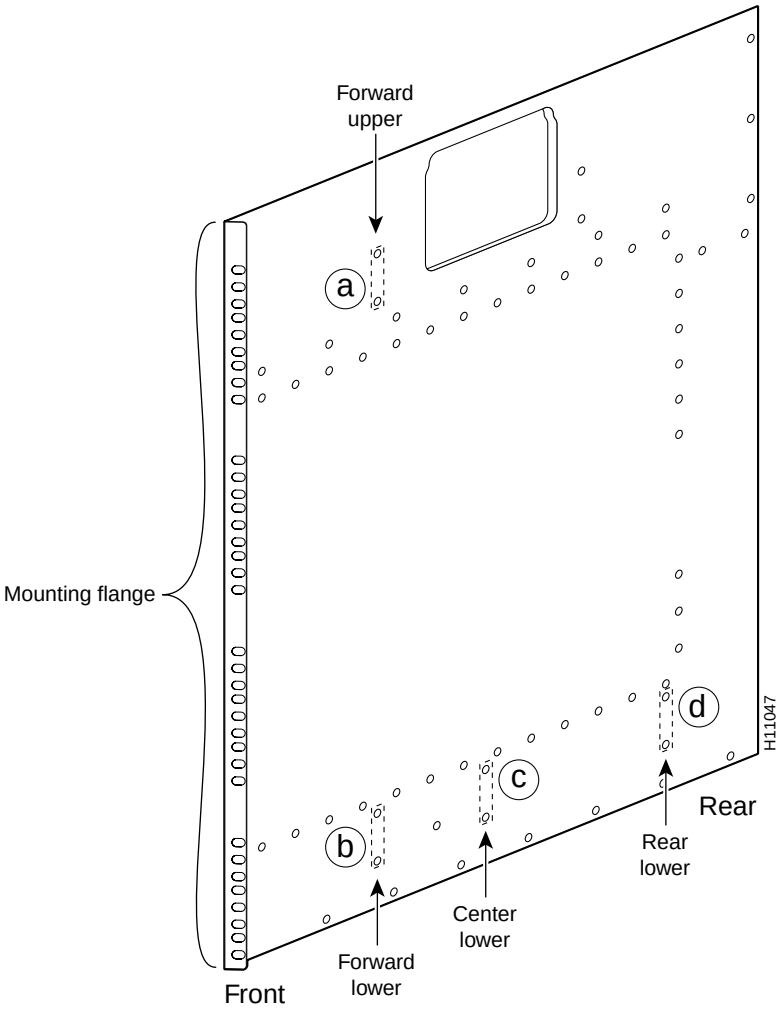
If you will be installing the dial shelf in an offset telco rack, you are now ready to install the rack-mount brackets on the chassis. Proceed to the following section, “Installing the Rack-Mount Brackets on the Chassis.” If you will be installing the dial shelf in a four post rack, the dial shelf is ready to rack mount and you may proceed to the next chapter.

Installing the Rack-Mount Brackets on the Chassis

Bracket placement depends on the type of rack you use to install your access server. This section describes both a 4-post rack installation and a telco rack installation.

Threaded holes on the chassis sides are strategically located to position and mount bracket hardware. The dial shelf also has a mounting flange in front for flush-front mounting. If you are mounting the dial shelf in a 4-post rack, you have the option of using two brackets (one on each side) placed toward the lower rear of the chassis (see Figure 2-7, position d) to support the chassis in the back. If you are mounting the dial shelf in a telco rack, you need to offset the dial shelf 5 in. beyond the rack center post and use six brackets (three on each side) at positions a, b, and c (See Figure 2-7).

Figure 2-7 Dial Shelf Bracket Mounting Hole Positions



If you are installing your access server in a telco rack, proceed to the following section, “Mounting Forward Brackets for an Offset Telco Rack Installation.”

If you are installing your access server in a 4-post rack, you do not need to install brackets on the chassis front; use the permanent metal flanges on the chassis front to install the dial shelf in the rack. (See Figure 2-7.) Proceed to the ““Installing the Dial Shelf in the Rack” section on page 3-6.

Mounting Forward Brackets for an Offset Telco Rack Installation

To install the forward rack-mount brackets on the dial shelf for an offset telco rack-mount configuration, complete the following steps:

Step 1 Locate the forward upper and lower threaded holes on the right side of the chassis. (See Figure 2-7, positions a and b.)

Step 2 Align one rack-mount bracket with a set of forward-upper threaded holes in the orientation shown in Figure 2-8, position a.

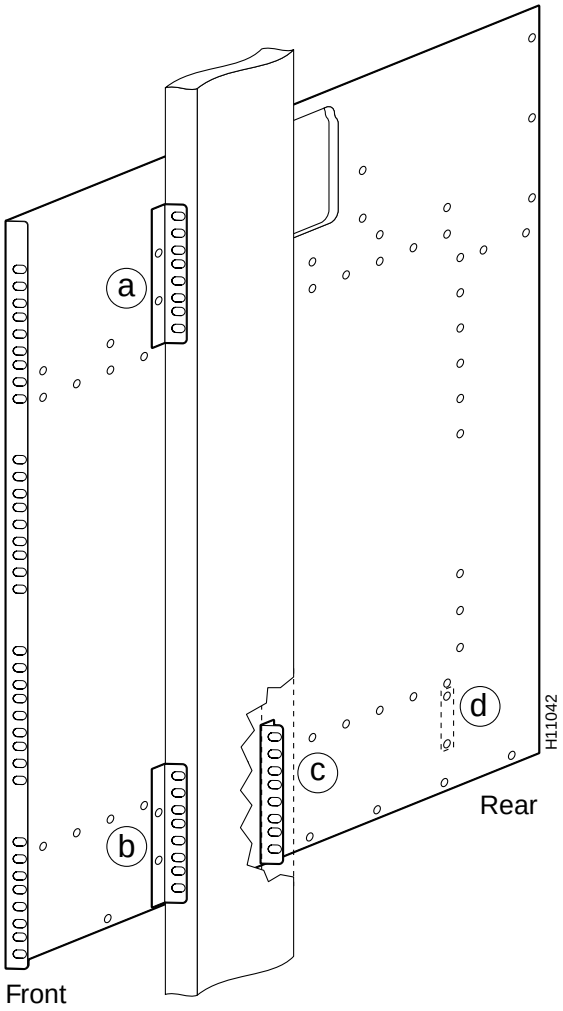
Step 3 Thread two M5 x 10-mm Phillips flathead screws through the bracket and into the side of the chassis. Tighten the screws using a No. 2 Phillips screwdriver.

Step 4 Align the second rack-mount bracket with the forward-lower position threaded holes in the orientation shown in Figure 2-8, position b.

Step 5 Fasten the bracket to the chassis using two screws as described in Step 3.

Step 6 Repeat Step 1 through Step 5 to mount the two forward brackets on the left side.

Figure 2-8 Positioning the Rack-Mount Brackets for an Offset Telco Rack Installation



Review the remaining sections regarding safety and special rack-mounting considerations, and then proceed to the next chapter, “Installing the Cisco AS5800.”

Plant Wiring

The following are guidelines for setting up the plant wiring and cabling at your site. When planning the location of the new system, consider the distance limitations for signaling, EMI, and connector compatibility, as described in the following sections.

Interference Considerations

When wires are run for any significant distance in an electromagnetic field, interference can occur. This fact has two implications for the construction of plant wiring:

- Bad wiring practice can result in radio interference emanating from the plant wiring.
- Strong EMI, especially when caused by lightning or radio transmitters, can destroy signal drivers and receivers and can even create an electrical hazard by conducting power surges through lines and into equipment. (Review the safety warnings in the section "Maintaining Safety with Electricity," earlier in this chapter.)

Note To predict and remedy strong EMI, you might need to consult experts in radio frequency interference (RFI).

If you use twisted-pair cable in your plant wiring with a good distribution of grounding conductors, the plant wiring is unlikely to emit radio interference. If you exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal, when applicable.

If wires exceed recommended distances, or if wires pass between buildings, give special consideration to the effect of a lightning strike in your vicinity. The electromagnetic pulse caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic devices. If such problems have occurred in the past, you may want to consult experts in electrical surge suppression and shielding.

Distance Limitations and Interface Specifications

The size of your network and the distances between connections depend on signal type and speed and on transmission media (the type of cabling used to transmit the signals). For example, standard coaxial cable has a greater channel capacity than twisted-pair cable. The distance and rate limits in the following descriptions are the IEEE recommended maximum speeds and distances for signaling; however, you can usually get good results at speeds and distances far greater than these. For example, the recommended maximum rate for V.35 is 2 Mbps, but it is commonly used at 4 Mbps without any problems. If you understand the electrical problems that might arise and can compensate for them, you should get good results with rates and distances greater than those shown here; however, do so at your own risk.

Note We recommend that you do not exceed specified transmission rate and distance limits.

When preparing your site for network connections to the access server, you should consider the following:

- Type of cabling required (fiber, thick or thin coaxial, shielded twisted-pair, or unshielded twisted-pair)
- Distance limitations
- Cables needed for interface connections
- Any additional interface equipment needed, such as transceivers, hubs, switches, modems, channel service units (CSUs), or data service units (DSUs)
- Cable pinouts (if you plan to build your cables)

Before installing the access server, have all additional external equipment and cables noted in the documentation that ships with each component on hand. For ordering information, contact a customer service representative.

Safety Recommendations

This section provides safety guidelines to help you avoid injury to yourself and avoid damage to the equipment. The following safety guidelines are recommended when working with any equipment that connects to electrical power or telephone wiring:

- Locate the emergency power-Off switch for the room in which you are working before beginning any procedures requiring access to the chassis interior.
- Disconnect all power and external cables before moving a chassis.
- Never work alone if potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Never perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.
- A 60A DC circuit breaker is recommended for the DC-input power source. This circuit breaker should protect against short-circuit and overcurrent faults in accordance with United States National Electrical Code NFPA 70 (United States), Canadian Electrical Code, part I, C22.1 (Canada), and IEC 364 (other countries).
- Only a DC power source that complies with the safety extra-low voltage (SELV) requirements in UL1950, CSA 950, EN 60950, and IEC950 can be connected to the DC-input power supply.
- A readily accessible disconnect device must be incorporated in the fixed wiring.
- This unit is to be installed in a restricted access area in accordance with articles 110-16, 110-17, and 110-18 of the National Electric Code, ANSI/NFPA 70.

Warning Before opening the chassis, disconnect the telephone-network cables to avoid contact with telephone-network voltages. To see translations of the warnings that appear in this publication, refer to the *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information* document that accompanied this device.

Maintaining Safety with Electricity

The Cisco 5814 dial shelf cards, dial shelf controller cards, and power supplies are designed to be removed and replaced while the system is operating, without causing damage to the system.

When working with the Cisco 7206 router shelf, however, you *must* power down the system before removing or replacing the I/O controller and network processing engine. For more information, refer to the *Cisco 7200 Series Installation and Configuration Guide* that shipped with your Cisco 7206 router shelf.

Warning Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Follow these basic guidelines when working with any electrical equipment:

- Never perform any action that creates a potential hazard to people or makes the equipment unsafe.

Warning Read the installation instructions before you connect the system to its power source. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

- Never install equipment that appears damaged.

In addition, use the guidelines that follow when working with any equipment that is disconnected from a power source, but still connected to telephone wiring or other network cabling.

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Always use caution when installing or modifying telephone lines.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which occurs when electronic cards or components are improperly handled, can result in complete or intermittent system failures. The access server components include printed circuit boards that are fixed in metal carriers. These metal carriers provide electromagnetic interference (EMI) shielding, connectors, ejector levers, or handles to protect against ESD. Although each carrier is designed to protect the boards, an antistatic strap should be used. Remember to handle the carriers by the ejector levers, handles, and carrier edges only; never touch the circuitry or connector pins.

Caution Always tighten the panel fasteners on the Cisco 5814 dial shelf cards and dial shelf controller cards and the captive screws on the Cisco 7206 router shelf network processing engine and I/O controller. These screws prevent accidental removal, provide proper system grounding, and help ensure that the bus connectors are properly seated.

The following are guidelines for preventing ESD damage:

- Always use an ESD wrist strap or ankle strap and ensure that it makes good skin contact.
- Verify that the equipment end of your ESD strap is attached to an unfinished chassis surface when handling a dial shelf card, module, or port adapter; *do not* touch the printed circuit board, and avoid contact between the printed circuit board and your clothing. When working with a dial shelf card, module, or port adapter, always place it “component side up” on an antistatic surface or in a static shielding bag. If returning an item to the factory, immediately place it in a static shielding bag.
- Ensure that all dial shelf cards and dial shelf controller cards within the Cisco 5814 dial shelf and the I/O controller and network processing engine within the Cisco 7206 router shelf are fully inserted in their respective chassis slots. Ensure that all ejector levers are in their locked positions and that all captive screws are properly tightened. The captive installation screws prevent accidental removal, provide proper grounding for the system, and help ensure that the bus connectors are properly seated.

Caution For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 Mohm.

Rack-Mounting Considerations

In a typical rack-mount configuration, you mount both the dial shelf and the router shelf together in a rack, with the dial shelf mounted below the router shelf. We do not recommend that you separate the dial shelf from the router shelf when configuring the hardware for this system; however, a 20-ft. interconnect cable is available if you need to install the router shelf in an adjacent rack. If you are using AC-input power, you mount the AC-input power shelf below the dial shelf.

There is no clearance requirement for mounting the router shelf directly above the dial shelf; however, if you install anything other than a Cisco 7206 router shelf above the dial shelf, follow the appropriate clearance requirements for the unit you install.

You can stack two access servers in a single rack; however, you must leave a minimum clearance of one rack unit between the two systems.

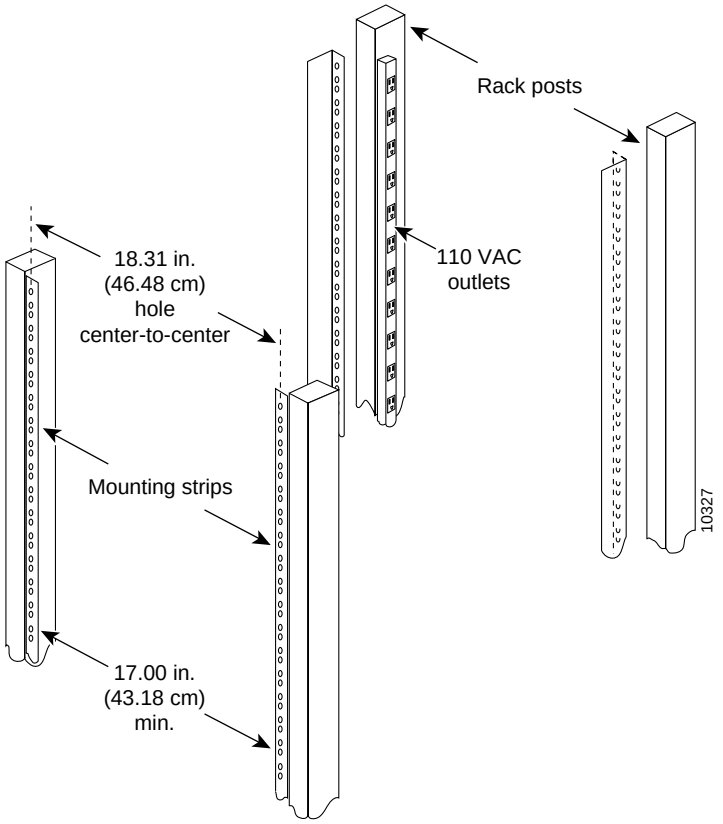
You must install the AC-input power shelf one rack unit, 1.75 in. (4.28 cm) below the dial shelf to accommodate the DC power cables, the monitor cable, the grounding cable, and the required safety cover.

Note One rack unit (1.75 in. or 4.4 cm) is the maximum distance between the dial shelf and the AC-input power shelf that accommodates the required safety cover.

Some equipment racks provide a power strip along the length of one of the mounting strips. If your rack has a power strip, consider the position of the strip when planning fastener points to ensure that you will be able to slide dial shelf cards and dial shelf controller cards straight out of their respective slots. If the power strip does impair a rack-mount installation, remove the power strip before installing the dial shelf in the rack, then replace it after the dial shelf is installed.

Figure 2-9 shows a typical 19-in. 4-post equipment rack with a power strip along one of the back posts.

Figure 2-9 Typical 19-Inch Equipment Rack Posts and Mounting Strips



To use the rack-mounting hardware provided with your Cisco 5814 dial shelf, consider the following guidelines:

- To mount the dial shelf between two 19-in. posts or rails, the inner clearance (the width between the *inner* sides of the two posts or rails) must be at least 17.5 in. (44.45 cm).
- The height of the dial shelf is 28 in. (71.12 cm).
- When mounting the dial shelf in 4-post or telco racks, be sure to use all the screws and brackets provided to secure the chassis to the rack posts.

When planning your rack installation, consider the following guidelines:

- Install the forward rack-mount brackets (if needed for your rack configuration) before you install the dial shelf in the rack; then install the rear brackets.
- Install the dial shelf in an open rack whenever possible. If installation in a cabinet is unavoidable, ensure that the cabinet has adequate ventilation.

Caution To prevent the dial shelf from overheating, never install your Cisco AS5800 in a cabinet or room that is not properly ventilated or air conditioned.

- Allow sufficient clearance around the rack for maintenance. You need 24 in. (61 cm) of clearance to remove and replace system components.
- Always install heavier equipment in the lower half of a rack to maintain a low center of gravity and prevent the rack from falling over.

Warning To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:

  - This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
  - When mounting this unit in a partially filled rack, load the rack from the bottom to the top, with the heaviest component at the bottom of the rack.
  - If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.
- If you use telco racks, be sure that the rack is bolted to the floor and secured, because in these types of installations only one end of the dial shelf mounts to the two rack posts. Ensure that the weight of the dial shelf does not make the rack unstable.
- When connecting the dial shelf (or the optional AC-input power shelf) to the site power source (supply circuit), take care not to overload the wiring.
- To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

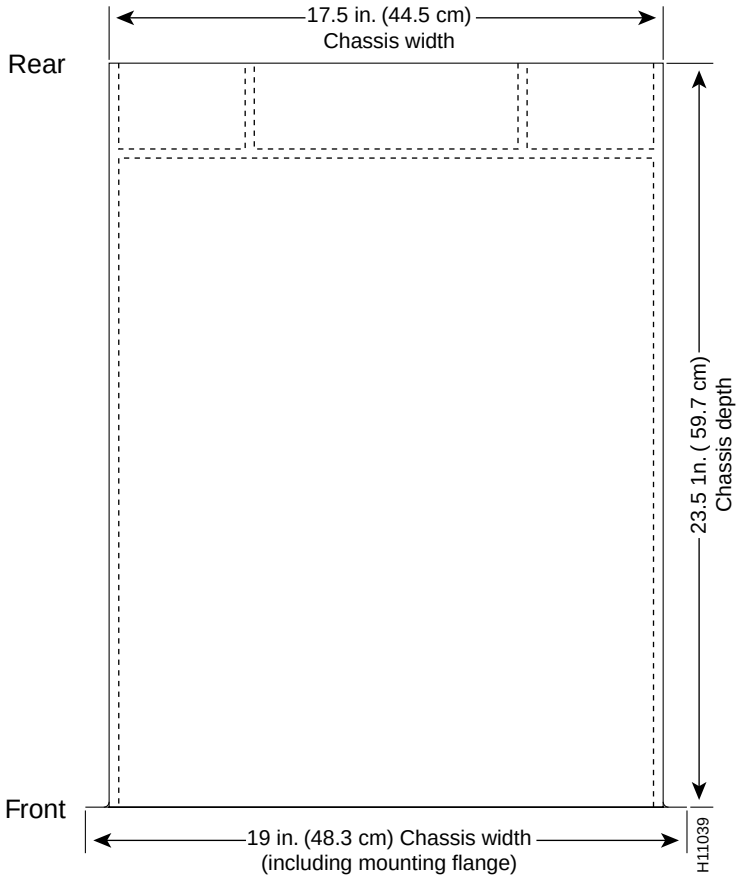
Warning Care must be given to connecting units to the supply circuit so that wiring is not overloaded. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

- Ensure that the dial shelf is connected to earth ground during normal use.

Warning This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

- If you plan to use an equipment shelf, ensure that the shelf is constructed to support the weight and dimensions of the dial shelf. Figure 2-10 shows the dial shelf footprint, which you will need if you are designing a customized shelf. We recommend that you use the rack-mount kit designed for your Cisco 5814 dial shelf.

Figure 2-10 Cisco 5814 Footprint and Outer Dimensions



Caution To prevent the rack from tipping when installing the router in telco racks, ensure that the rack is bolted to the floor and, if necessary, anchored with appropriate fixtures.

Caution To maintain a low center of gravity, ensure that heavier equipment is installed near the bottom of the rack.

You are now ready to install the dial shelf in the rack. Proceed to the "Installing the Dial Shelf in the Rack" section on page 3-6.

Site Specifications

Table 2-1 lists the operating and nonoperating environmental site requirements. The following ranges are those within which the access server will continue to operate; however, a measurement that is approaching the minimum or maximum of a range indicates a potential problem. You can maintain normal operation by anticipating and correcting environmental anomalies before they approach the maximum operating range.

Airflow to cool the access server is from front to back in the dial shelf chassis and from right to left in the router shelf chassis (when viewing the router from the front). Adhere to all spacing requirements for proper airflow maintenance.

Table 2-1 Specifications for Operating and Nonoperating Environments

Specification	Minimum	Maximum
Temperature, ambient operating	32°F (0°C)	104°F (40°C)
Temperature, ambient nonoperating and storage	–4°F (–20°C)	149°F (65°C)
Humidity, ambient (noncondensing) operating	10%	90%
Humidity, ambient (noncondensing) nonoperating and storage	5%	95%
Altitude, operating and nonoperating	Sea level	10,000 ft (3050 m)
Vibration, operating	5–200 Hz, 0.5 g (1 oct./min.)	–
Vibration, nonoperating	5–200 Hz, 1 g (1 oct./min.) 200–500 Hz, 2 g (1 oct./min.)	–
Clearance, air intake and exhaust	24 in. (60.95 cm)	–

Preventive Site Configuration: Maintaining Normal Operation

Planning a proper location for the access server and the layout of your equipment rack or wiring closet are essential for successful system operation. Equipment placed too close together or ventilated inadequately can cause system overtemperature conditions. In addition, chassis panels made inaccessible by poor equipment placement impair system maintenance.

Follow these precautions and recommendations when planning power connections to the Cisco AS5800:

- Check the power at your site before installation and periodically after installation to ensure that you are receiving clean power. Install a power conditioner if necessary.
- Install proper grounding to avoid damage from lightning and power surges.

Installing the Cisco AS5800

This chapter explains the procedures for installing the access server. Installation involves the following tasks:

1. Connecting cables to the AC power supply (AC installs only)
1. Rack-mounting the AC power supply (AC installs only)
2. Rack-mounting the dial shelf
3. Replacing the blower assembly, DC PEMs, and dial shelf cards or controller cards
4. Connecting power inputs to the DC PEMs
5. Mounting the AC power safety cover (AC installs only)
6. Rack-mounting the router shelf
7. Connecting all remaining cable connections

Estimated time to install the access server hardware is between 2 and 3 hours.

Note If you are installing the optional AC-input power shelf, refer to the"Connecting to an AC Power Source" section on page 3-1.

This chapter assumes that you are installing the access server manually. If you have access to a forklift or hydraulic equipment during the installation, you can omit certain steps, which are specified later in this chapter.

Connecting to an AC Power Source

If your site has access to an AC power source only, you need to install the optional AC-input power shelf (DS58-PWR-2AC) to convert to DC-input power for the dial shelf.

AC-input power is accepted using a separate, self-contained AC-input power shelf, which converts AC-input power to DC-output for use by the DC-powered dial shelf. The AC-input is supplied by two AC power cables (CAB-DS-AC=, other options available), converted to –48V DC-output power for the dial shelf PEMs using two AC-to-DC power cables (DS5800-CAB-ACDC=) supplied by Cisco.

The AC-input power shelf is an optional component of the Cisco AS5800 and is used to convert AC-input power into DC-output power for the DC-powered Cisco 5814 dial shelf. The AC-input power shelf contains two AC-input power supplies.

This section explains how to attach the power cables and rack-mount the AC-input power shelf. For detailed cabling specification tables, refer to Appendix A, “Cisco AS5800 Specifications.”

Parts Required

You need the following tools and parts to rack-mount the power shelf:

- AC-input power shelf or enhanced AC-input power shelf with dual AC power supplies
- Two AC power cables
- Two pairs of DC interconnect cables (CAB-5800-ACDC=)
- One DB-25 to DB-9 monitor cable (CAB-PEM=)
- One 6 gauge ground cable
- Two hex nuts and M4 screws
- Four 10-32 x 3/8-in. slotted screws
- One metal safety cover and screws
- 3/8-in. nut driver
- No. 2 Phillips screwdriver
- 1/4-in. flat-blade screwdriver
- Wire strippers, if needed, for your DC power cables
- Several cable ties to temporarily anchor the cables out of the way, if necessary

To connect the power cables and power up the system, proceed to the following section “Connecting the AC Power Cables.”

Mount the Cables on the AC Power Supply

It is possible to mount the cables on the AC power supply after it has been rack-mounted, but given the limited space in and around many equipment racks, we recommend that you mount the cables before rack-mounting the AC power supply. Figure 3-1 shows cables mounted on a standard AC power supply, but the process is the same for the enhanced power supply. For a picture of the rear of the enhanced power supply, see Figure 1-17. To mount the AC power supply cables:

Step 1 Attach the ground-cable double ring lug to the ground posts on the rear of the AC-input power shelf. (See Figure 3-1, lower chassis.)

Step 2 Secure the double ring lug to both threaded ground posts with a hex nut on each stud.

Step 3 Attach two red DC-interconnect power-cable ring lugs to the terminal stud labeled BUS + on the AC power shelf chassis rear. (See Figure 3-1.)

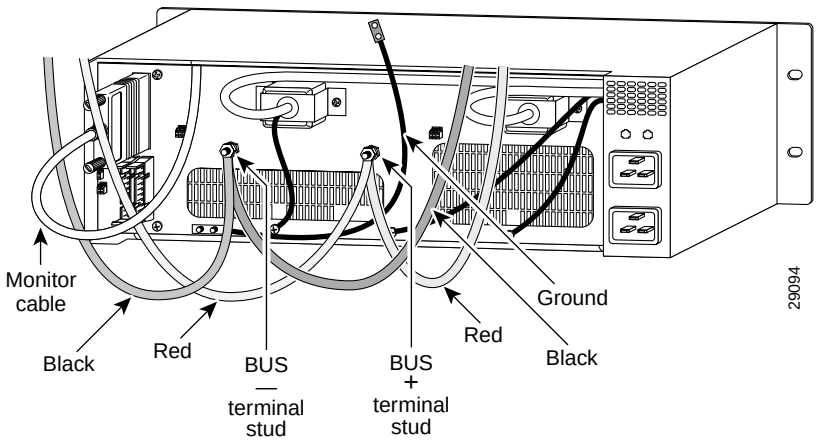
Step 4 Secure the ring lugs to the threaded stud with a hex nut.

Step 5 Attach two black DC-interconnect power-cable ring lugs to the terminal stud labeled BUS – on the AC power shelf chassis rear. (Refer to Figure 3-1.)

Step 6 Secure the ring lugs to the threaded terminal stud with a hex nut.

Step 7 Attach the monitor cable DB-25 plug to the DB-25 receptacle on the rear of the AC-input power shelf. (See Figure 3-1.) Tighten the jackscrews.

Figure 3-1 Cables Mounted on the Rear of the AC Power Shelf



Installing the Power Shelf in the Rack

You install the power shelf in the rack by securing the permanent mounting flanges to two posts or mounting strips in the rack using the slotted mounting screws provided. Because the mounting flanges support the weight of the entire power shelf, be sure to use at least two slotted screws per mounting flange.

Note You need to leave 1.75 in. (4.45 cm) between the power shelf and the dial shelf that you will install directly above it.

Caution To maintain a low center of gravity, ensure that heavier equipment is installed near the bottom of the rack.

Caution The AC-input power shelf with both power supplies installed weighs approximately 47 lb (21.31 kg). Use caution when lifting the power shelf. Bend your knees and lift using your legs. Do not strain your back. We recommend that you remove the power supplies from the AC-input power shelf before you mount it in a rack.

To remove a standard power supply, follow these steps:

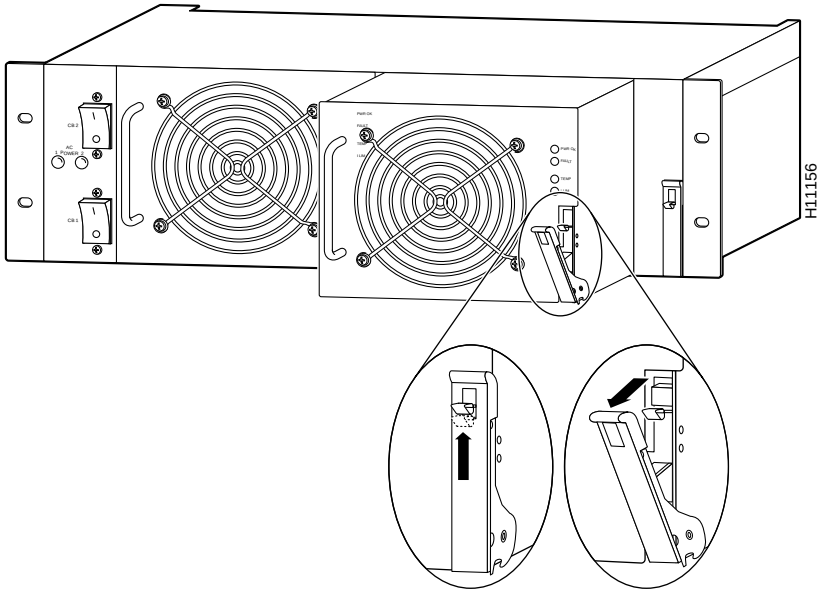
Caution A single power supply weighs 14.5 lb (6.6 kg). Use both hands when removing or replacing a power supply.

Step 1 Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.

Step 2 Lift the metal spring-clip in the center of the ejector lever to release the lock. (The power supplies are secured by self-locking ejector levers. (See Figure 3-2.)

Step 3 Apply downward pressure to the ejector lever to disconnect the power supply from the power backplane.

Figure 3-2 Removing and Replacing a Power Supply



Step 4 Grasp the power supply handle and pull the power supply halfway out of the bay. Then with your other hand under the power supply to support it, pull the power supply completely out of the bay.

Step 5 Repeat Step 1 through Step 4 for the other power supply.

To remove a power supply for the enhanced AC-input power shelf, follow these steps:

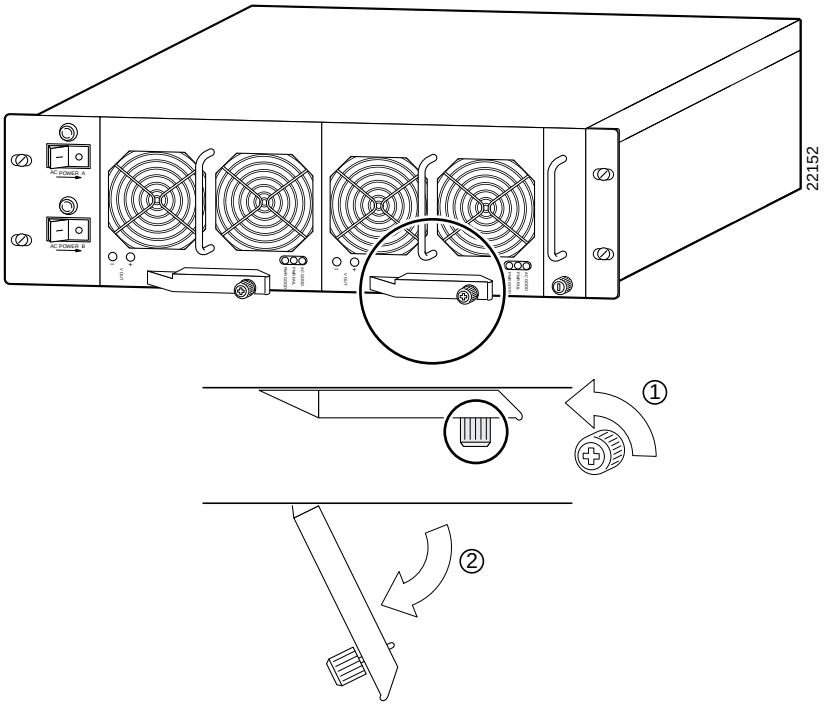
Caution A single power supply weighs 11 lb (5 kg). Use both hands when removing or replacing a power supply.

Step 1 Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.

Step 2 Twist the thumbscrew located in the ejector lever to unlock the power supply (See Figure 3-2.)

Step 3 Lift the ejector lever to disconnect the power supply from the power backplane.

Figure 3-3 Removing and Replacing an Enhanced Shelf Power Supply



Step 4 Grasp the power supply handle and pull the power supply halfway out of the bay. Then with your other hand under the power supply to support it, pull the power supply completely out of the bay.

Step 5 Repeat Step 1 through Step 4 for the other power supply.

To install the power shelf in the rack, follow these steps:

Step 1 Verify that your path to the rack is unobstructed, and ensure that the rack is stabilized.

Step 2 Position the power shelf in front of the rack. To prevent injury, avoid sudden twists or moves.

Step 3 Lift and slide the power shelf into the rack, pushing it back until the front mounting flanges meet the mounting strips or posts on both sides of the equipment rack.

Step 4 Position the power shelf so that the holes in the mounting flanges are aligned to those in the mounting strips, while keeping the mounting flanges flush against the posts or mounting strips.

Step 5 Insert the 10-32 x 3/8-inch slotted screws (two screws per side at a minimum) through the power shelf mounting flange and into the mounting strip. Tighten all screws using a 1/4-inch flat blade screwdriver.

Step 6 Replace the power supplies.

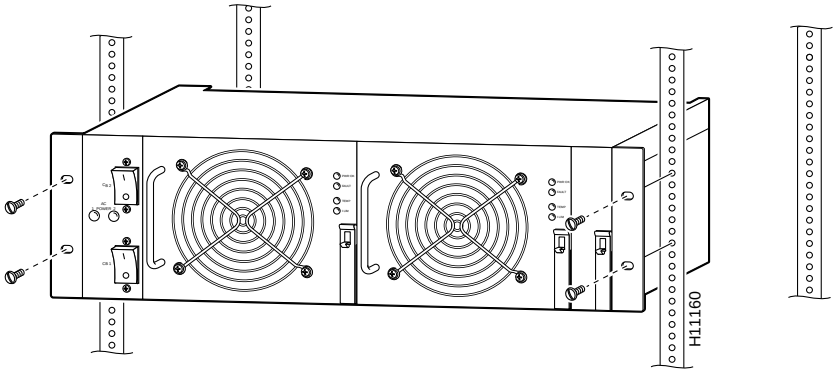
(a) Slide the power supply into the power supply bay. Push the power supply fully into the power shelf until the front is flush against the power shelf frame. To prevent damage to the backplane connector, do not jam the power supply into the bay.

(b) Push the self-locking ejector lever upward until the metal spring-clip locks into place (listen for the click). (See Figure 3-2 or Figure 3-3.)

(c) Repeat Step a and Step b on the other power supply.

Figure 3-4 illustrates the standard AC-input power shelf installed in a 4-post rack.

Figure 3-4 Installing the AC-Input Power Shelf in a 4-Post Rack



Installing the Dial Shelf in the Rack

One person can not install the dial shelf chassis in the rack unassisted. Two or preferably three people will be needed.

To secure the rack-mount brackets to the posts or mounting strips in the rack, you must use the slotted mounting screws provided. Because the brackets support the entire weight of the chassis, be sure to use at least two slotted screws per bracket.

Be sure you have the dial shelf prepped as described in the previous chapter before installing it in the rack. To install the dial shelf chassis in the rack, complete the following steps:

Tips To prevent injury, review the safety precautions in the "Safety Recommendations" section on page 2-14 before installing the dial shelf in the rack.

Step 1 Verify that your path to the rack is unobstructed and ensure that the rack is stabilized.

Step 2 Attach one support bracket to each front post or mounting strip using the provided slotted screws and a 1/4-in., flat-blade screwdriver. Ensure that the support brackets are level. (See Figure 3-5 and Figure 3-7.)

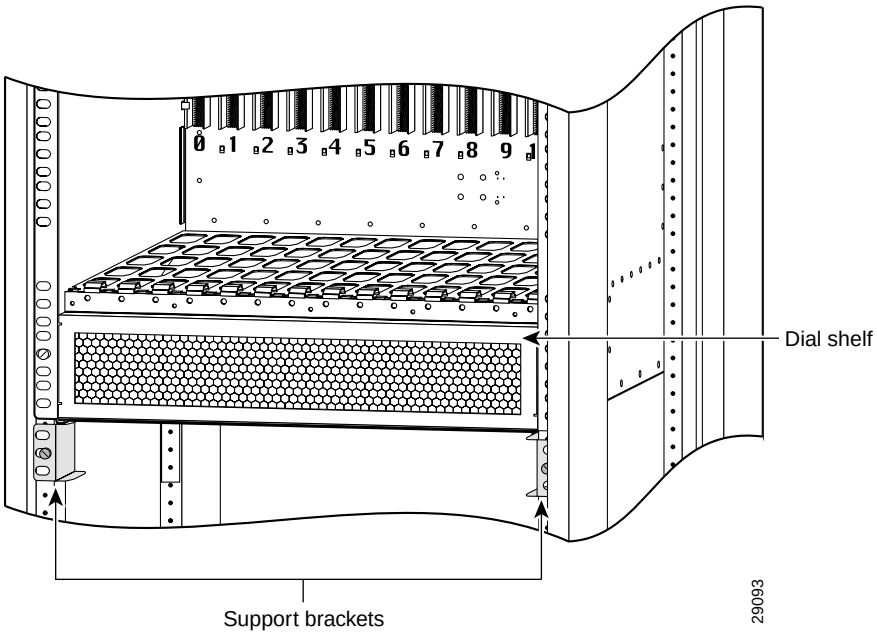
Note Because the brackets support the weight of the entire chassis, be sure to use at least two slotted screws per bracket. These brackets also ensure that the required space between the dial shelf and the power supply is available.

Step 3 Position the dial shelf chassis in front of the rack.

Warning Two people are required to lift the chassis. Use the handles on the chassis sides. To prevent injury, keep your back straight and lift with your legs, not your back. To prevent damage to the chassis and components, never attempt to lift the chassis with the handles on the power supplies, the filter module, or on the blower assembly. These handles are not designed to support the weight of the chassis. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Step 4 Lift and slide the dial shelf chassis into the rack, resting it on the two support brackets. Push it back until the forward brackets or chassis mounting flanges meet the mounting strips or posts on both sides of the equipment rack. When the chassis is slid back all the way, keep one or two people holding the chassis in place using the handles, or gripping the chassis where the DC PEMs belong.

Figure 3-5 Mounting Support Brackets for the Cisco AS5800



Note The brackets support the chassis until you complete the installation. Removing the brackets is optional. If you leave the brackets installed, they can be used as spacers between the dial shelf and the optional AC-input power shelf.

Step 5 While two people hold the dial shelf steady, a third person should insert the 10-32 x 3/8-in. slotted screws (2 screws per bracket) through the brackets (or chassis mounting flange) and into the mounting strip. Install two screws near the bottom of the flanges first, then install more screws above them, spaced evenly along the flange. Tighten all the screws using a 1/4-in. flat-blade screwdriver.

To complete the dial shelf rack installation, mount the rear set of brackets to the chassis. Proceed to the following section “Mounting the Rear Brackets.”

Mounting the Rear Brackets

This section explains how to mount the rear brackets for telco and 4-post rack installations.

Note You must mount the rear brackets *after* you install the dial shelf in the rack.

Telco Rack—Rear Bracket Installation

For a telco rack-mount installation, mount the rear bracket as follows:

Step 1 Align one rear bracket to the lower center position threaded holes in the chassis side (see Figure 2-7, position c), with the bracket flange against the center post.

Step 2 Thread two M5 x 10-mm Phillips flathead screws through the bracket and into the side of the chassis.

Step 3 Using a No. 2 Phillips screwdriver, tighten the screws.

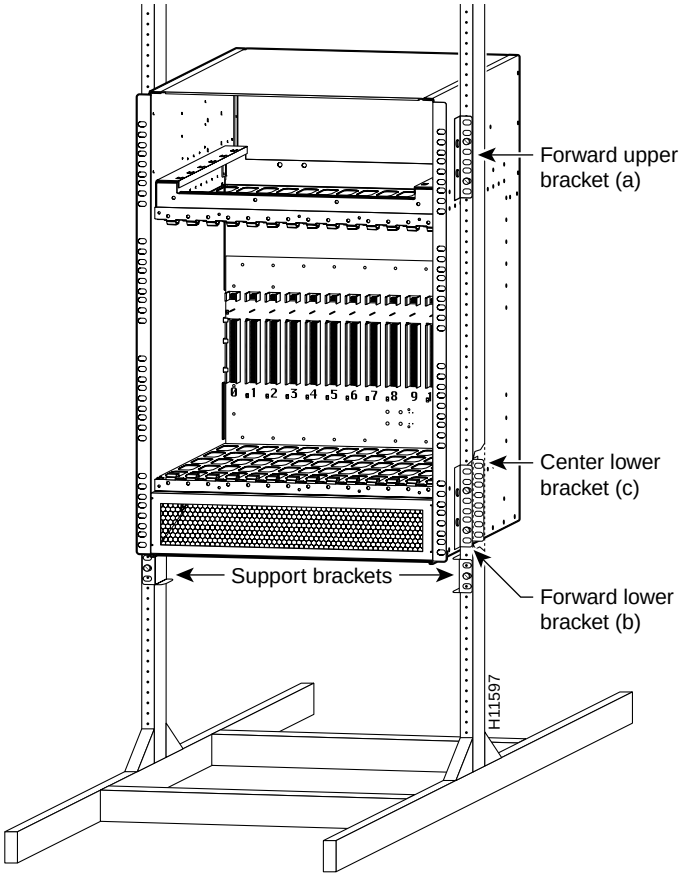
Step 4 Repeat Step 1 through Step 3 to mount the rear bracket on the other side of the chassis.

Step 5 Insert the 10-32 x 3/8-in. slotted screws (2 screws per bracket) through the brackets and into the equipment rack-mounting strip.

Step 6 Tighten all the screws using a 1/4-in. flat-blade screwdriver.

Figure 3-6 shows a dial shelf installed in a telco rack. The bracket positions labeled a, b, and c correspond to Figure 2-8, positions a, b, and c.

Figure 3-6 Cisco 5814 Dial Shelf Installed in a Telco Rack



This completes the dial shelf rack-mounting procedures for a telco rack. Proceed to the section "Replacing the Dial Shelf Components."

4-Post Rack—Rear Bracket Installation

For a 4-post rack-mount installation, mount the optional rear brackets to the sides of the chassis as follows:

Step 1 Align one bracket to the lower rear position threaded holes in the chassis side (see Figure 2-7, position d), with the bracket flange against the mounting strip or rack post, as shown in Figure 3-6.

Step 2 Thread two M5 x 10-mm Phillips flathead screws through the bracket and into the side of the chassis.

Step 3 Using a No. 2 Phillips screwdriver, tighten the screws.

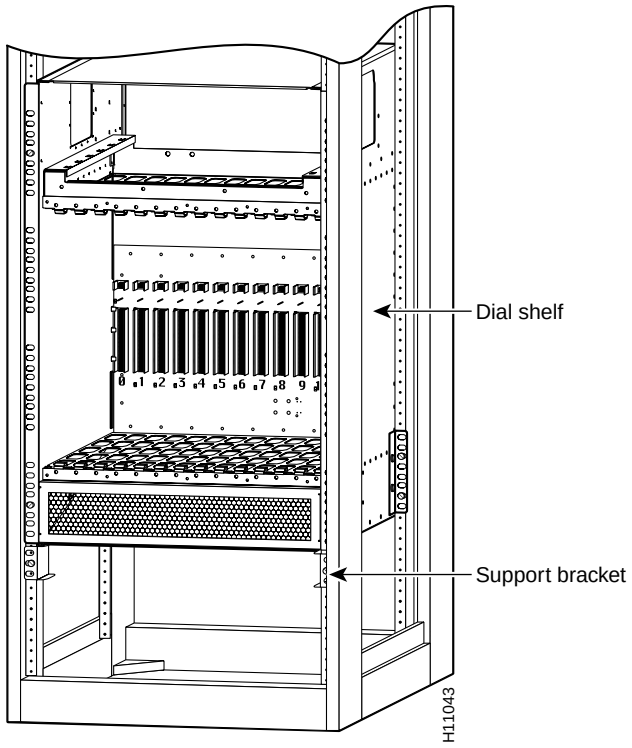
Step 4 Repeat Step 1 through Step 3 to mount the rear bracket on the other side of the chassis.

Step 5 Position the rear equipment rack-mounting strips flush with the dial shelf chassis rear rack-mounting brackets and secure the strips in the equipment rack.

Step 6 Insert the 10-32 x 3/8-in. slotted screws (2 screws per bracket) through the brackets and into the equipment rack-mounting strip.

Step 7 Tighten the screws using a 1/4-in. flat-blade screwdriver.

Figure 3-7 Cisco 5814 Dial Shelf Installed in a 4-Post Rack



This completes the dial shelf rack-mounting procedures for a 4-post rack. Proceed to the following section “Replacing the Dial Shelf Components.”

Replacing the Dial Shelf Components

This section contains instructions for replacing the dial shelf components.

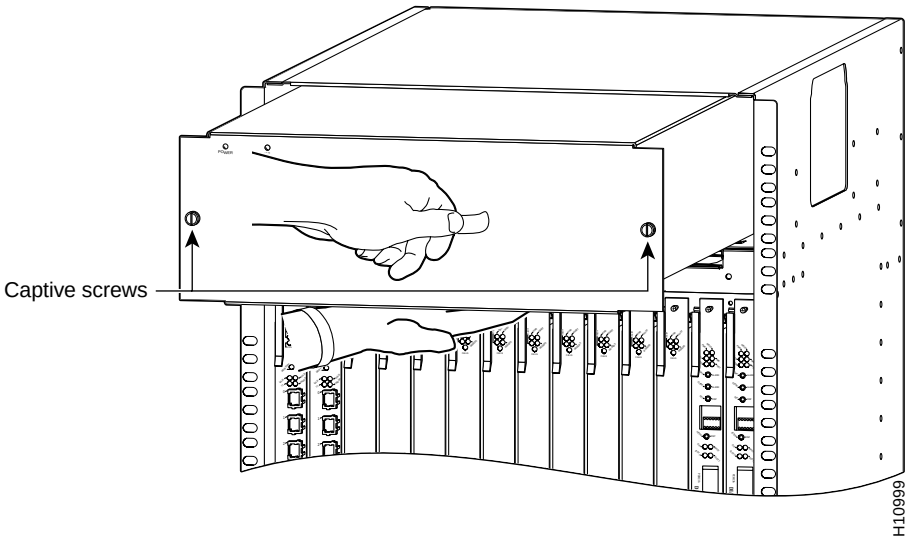
Replacing the Blower Assembly

Replace the blower module in the dial shelf as follows:

Caution The blower assembly weighs 27.5 lb (12.5 kg). Use two hands when removing or replacing the blower assembly.

Step 1 Place one hand on the blower assembly handle and place your other hand under the blower assembly. (See Figure 3-8.)

Figure 3-8 Replacing the Blower Assembly



Step 2 Align the blower assembly with the chassis opening and slide the blower assembly into the dial shelf chassis.

Step 3 Push the blower assembly all the way into the dial shelf chassis until the connector on the rear of the blower assembly is fully seated in the chassis.

Step 4 Tighten the two captive thumbscrews on the blower assembly front panel.

Replacing the Power-Entry Modules

To reinstall the PEMs, complete the following steps. (Refer to Figure 3-9 to locate the PEMs in the dial shelf.)

Step 1 Grasp the PEM handle and carefully align the PEM with the DC-input power supply bay.

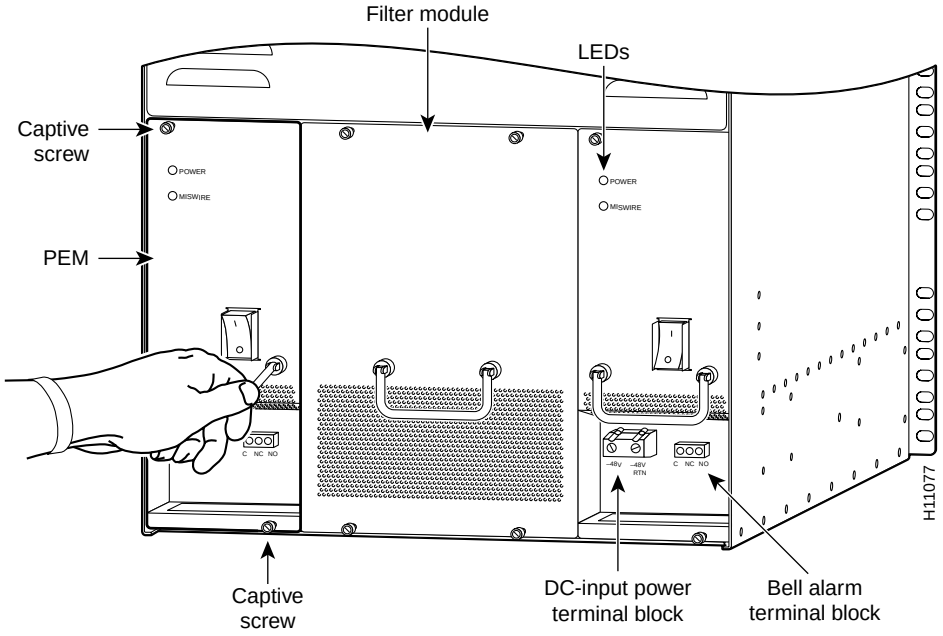
Step 2 Slide the PEM into the power supply bay until it is fully seated and connected to the backplane connectors.

Step 3 Using a 1/4-inch flat-blade screwdriver, tighten the captive screws on the PEM front panel.

Step 4 Plug the alarm cables into the bell alarm terminal block. (See Figure 3-9.)

Step 5 Repeat Step 1 to Step 4 for the other PEM.

Figure 3-9 Replacing a PEM



This completes the procedure for replacing a PEM in the dial shelf.

Replacing the Dial Shelf Cards and Dial Shelf Controller Card

Replace the trunk cards, modem cards, and dial shelf controller cards in the chassis as follows:

Timesaver Your dial shelf arrived with trunk cards, modem cards, and dial shelf controller cards installed in the proper slots. You can refer to the notes you made before removing the cards (as described in the "Removing Dial Shelf Cards and Dial Shelf Controller Cards" section on page 2-9) when replacing cards in the dial shelf chassis.

If you did not note the original card configuration, replace the cards in the dial shelf slots, which are numbered from left to right, as follows:

- Trunk cards must be installed in slots numbered 0 to 5, beginning with slot 0.
- Modem cards can be installed in slots numbered on the backplane as slots 2 to 11.
- Dial shelf controller cards must be installed in slots numbered on the backplane as slot 12 and slot 13. A single dial shelf controller card can be installed in either slot 12 or slot 13.

Caution Trunk cards and modem cards weigh 8 lb (3.6 kg) each. Dial shelf controller cards weigh 8.5 lb (3.8 kg) each. Use two hands when removing or replacing cards in the dial shelf.

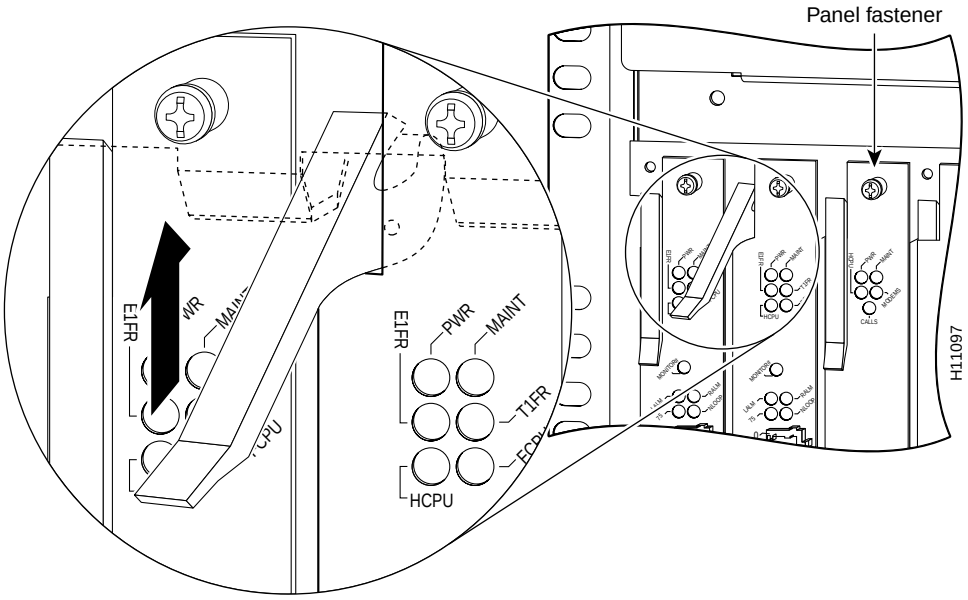
Step 1 Attach your ESD-preventive wrist strap between you and an unpainted chassis surface.

Caution To prevent ESD damage, handle trunk cards by ejector levers and carrier edges only and use an ESD-preventive wrist strap or other grounding device.

Step 2 Carefully align the card carrier guides with the top and bottom grooves in the slot. Avoid touching the circuitry or any connector pins.

Step 3 Slide the carrier into the slot until the ejector levers make contact with the chassis frame. (See Figure 3-10.)

Figure 3-10 Using the Ejector Levers



Step 4 Seat the card in the backplane by pushing the card firmly until the ejector levers fold in toward the trunk card front panel and the front panel is flush with the chassis frame.

Caution Always use the ejector levers when disengaging or seating trunk cards, modem cards, or dial shelf controller cards in the dial shelf. Failure to do so can cause erroneous system error messages indicating a card failure. However, do *not* use the ejector levers to lift or support the weight of the cards.

Step 5 Using a No. 2 Phillips screwdriver, tighten the panel fasteners on the top and bottom of the card front panel. This prevents the card from becoming partially dislodged from the backplane and ensures proper EMI shielding.

Caution Always tighten the panel fasteners on trunk cards, modem cards, and dial shelf controller cards. These fasteners prevent accidental removal and provide proper grounding for the system.

Step 6 Repeat Step 3 through Step 5 for all remaining cards you want to install.

Caution To avoid erroneous failure messages, remove or insert only one trunk card at a time. Also, after inserting or removing a trunk card, allow at least 15 sec. before removing or inserting another trunk card so that the system can reinitialize and note the current configuration of all interfaces.

Step 7 Install a blank filler card (DS58-BLANK=) in all empty card slots to keep the chassis dust-free and to maintain proper airflow.

Caution To prevent the overheating of internal components, always install blank filler cards in empty slots to maintain the proper flow of cooling air across the cards.

Connecting Cables to the Dial Shelf

Once the dial shelf has been rack-mounted and all components have been reinstalled into the dial shelf, DC power connections from a DC source or AC-input power shelf can be connected to the dial shelf. The monitor connection from an AC-input power shelf should also be connected at this stage. The following sections assume the use of the optional AC-input power shelf. If your installation will use a DC power source, see the "Connecting to a DC Power Source" section on page 3-23.

Connecting the AC Power Cables

You need to connect all cables between the AC-input power shelf and the dial shelf before you connect the power shelf to your AC power source. You also need to install the provided electrical connection safety cover at the rear of the power shelf before you power up the system. For detailed cabling specification tables, refer to Appendix A, "Cisco AS5800 Specifications."

Warning This unit has more than one power cord. To reduce the risk of electric shock, disconnect the two power supply cords before servicing the unit. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Grounding the AC-Input Power Shelf to the Dial Shelf

For detailed cabling specification information, refer to Appendix A, "Cisco AS5800 Specifications." To attach the ground cable between the AC-input power shelf and the dial shelf, complete the following steps:

Step 1 Thread an M4 screw through one hole of the double ring lug on the other end of the ground cable; then thread the screw into the threaded pemnut in the underside of the dial shelf chassis and partially tighten the screw. (See Figure 3-11, upper chassis or Figure 3-12 for an enhanced power shelf.)

Step 2 Align the second ring lug hole with the second pemnut in the underside of the dial shelf chassis and thread a screw through the hole.

Step 3 Using a No. 2 Phillips screwdriver, tighten both screws.

Figure 3-11 Attaching the Ground Wire to a Standard Power Shelf

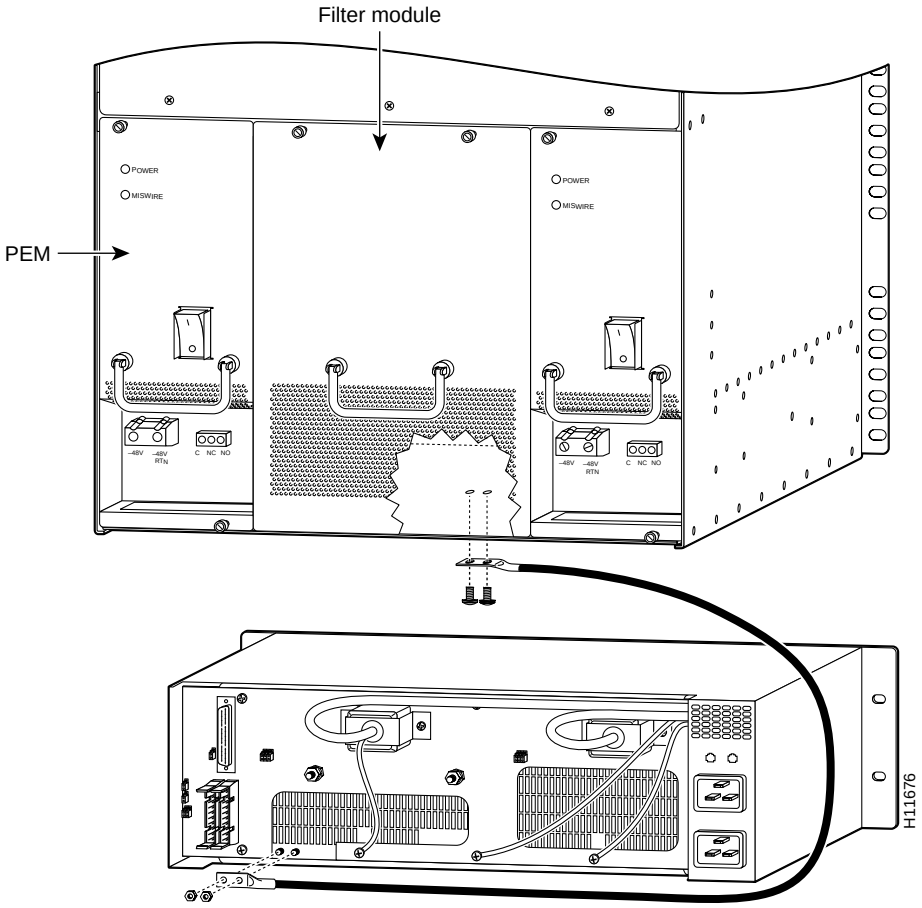
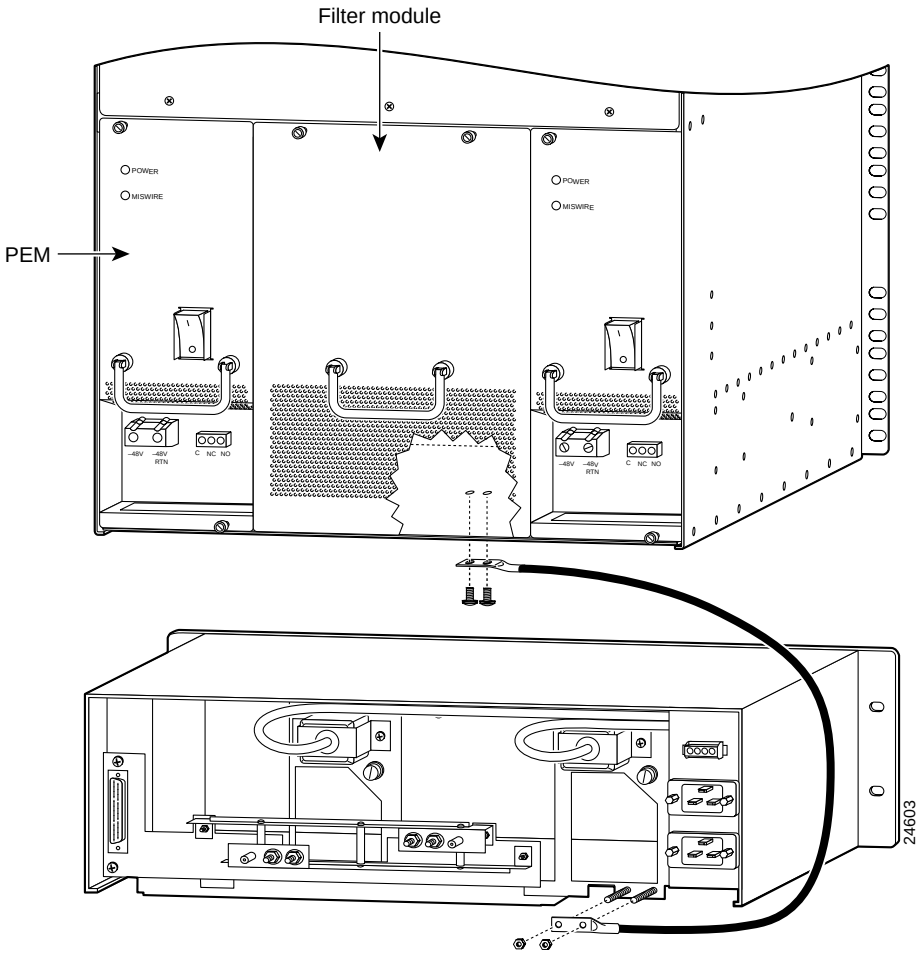


Figure 3-12 Attaching the Ground Wire to an Enhanced Power Shelf



This completes the ground cable installation.

Connecting the DC Power Cables

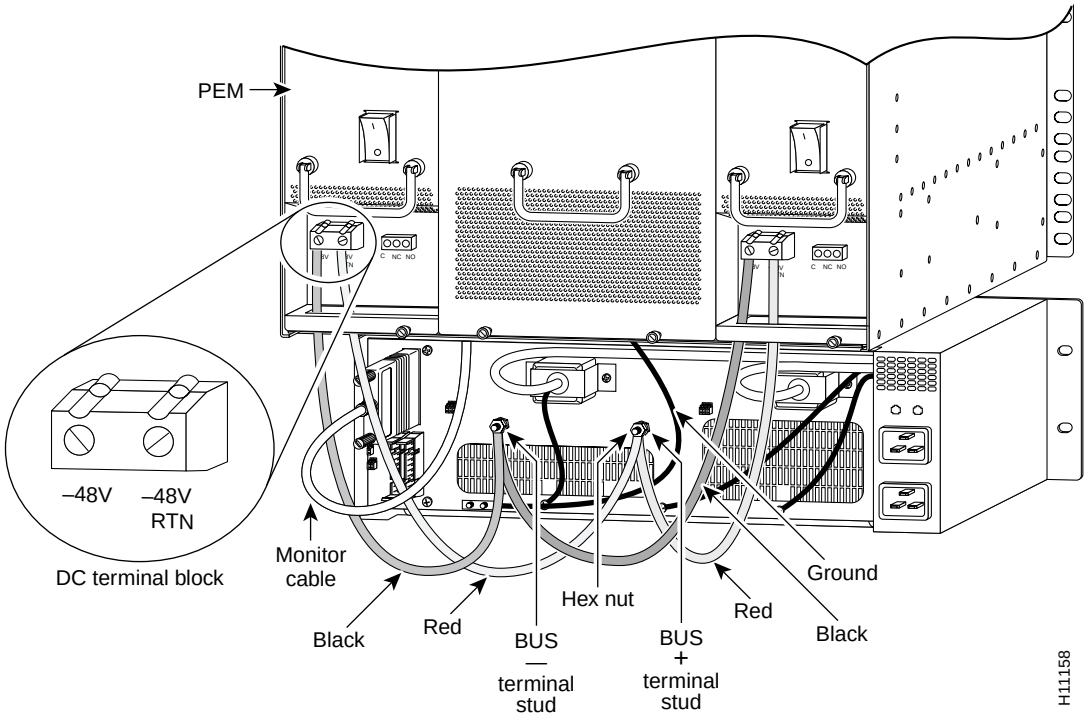
For detailed cabling specification information, refer to Appendix A, "Cisco AS5800 Specifications." To connect the DC interconnect power cables, complete the following steps:

Step 1 Verify that the AC-input power switches on the power shelf front panel are in the OFF (O) position.

Step 2 Loosen the screws in each PEM DC terminal block, located on the back of the dial shelf. (See Figure 3-13.)

Step 3 Fit the exposed wire end of one red insulated cable into the DC terminal block labeled –48V RTN on each PEM and securely tighten the terminal block connector screws. (See Figure 3-13.)

Figure 3-13 Connecting the DC-Interconnect Cables



Step 4 Fit the exposed wire end of the black insulated cable into the DC terminal block labeled –48V on each PEM and securely tighten the terminal block connector screws. Repeat for the other PEM. (See Figure 3-13)

Note You must attach the red DC cables to the stud labeled BUS + on the AC-input power shelf and connect the other end to a –48V RTN terminal on each PEM. You must attach the black DC cables to the stud labeled BUS – and connect the other end to a –48V terminal on each PEM. If the two DC conductors entering the PEM terminal block are reversed, a yellow warning LED on the PEM lights to indicate a miswire. No damage will occur; however, you must power OFF the power at the source and reverse the connections.

This completes the DC power cabling installation. You must now connect the monitor cable from the AC-input power shelf to the dial shelf filter module.

Connecting the Monitor Cable

For detailed cabling specification information, refer to Appendix A, "Cisco AS5800 Specifications." To connect the monitor cable, complete the following steps:

Step 1 Attach the monitor cable DB-9 plug to the DB-9 receptacle at the base of the dial shelf filter module. (See Figure 3-14, or Figure 3-14 for an enhanced power shelf.)

Step 2 Tighten the jackscrews.

Figure 3-14 Connecting the Monitor Cable

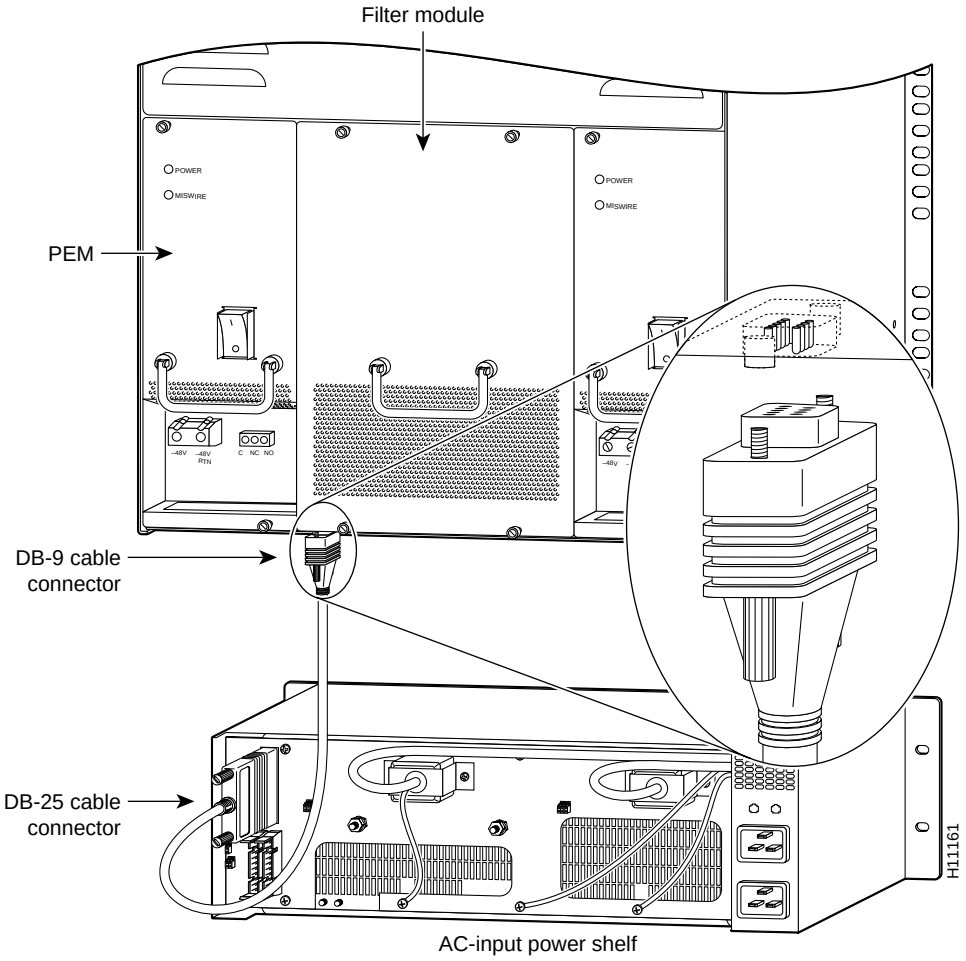
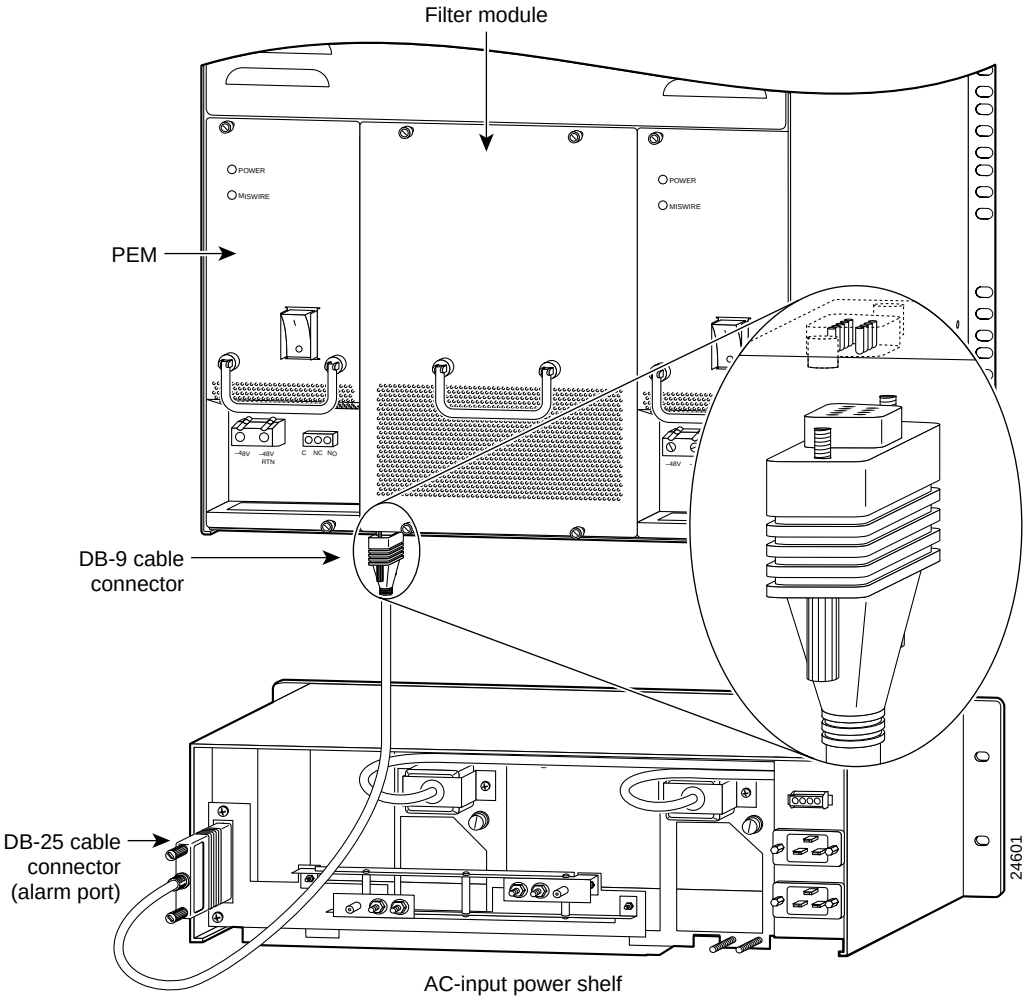


Figure 3-15 Connecting the Monitor Cable to an Enhanced Power Shelf



This completes the monitor cable installation. You must now connect the AC-input power cords.

Connecting the AC Power Cords

For detailed cabling specification information, refer to Appendix A, "Cisco AS5800 Specifications." To connect the AC power cords, complete the following steps:

Step 1 Feed the rectangular ends of the AC power cords through the spaces in the DC PEMs as shown in Figure 3-18.

Step 2 Plug each AC power cord into an AC receptacle on the AC-input power shelf rear. (See Figure 3-16, or Figure 3-17 for an enhanced power shelf.)

Step 3 If you are using an enhanced power shelf, connect the opposite end of each power cord to a 220VAC power source. If you are using a standard power shelf, install the safety cover before connecting to a power source.

Note For maximum redundancy, connect each power cord to a separate AC source.

Caution Do not plug the AC-input power shelf into the same power source as the router shelf or into the power strip on your equipment rack. The 20A connectors on the AC-input power shelf are incompatible with the power source used for the router shelf and with the 15A power strips used in most equipment racks.

Figure 3-16 Connecting the AC Power Cords to a Standard Power Shelf

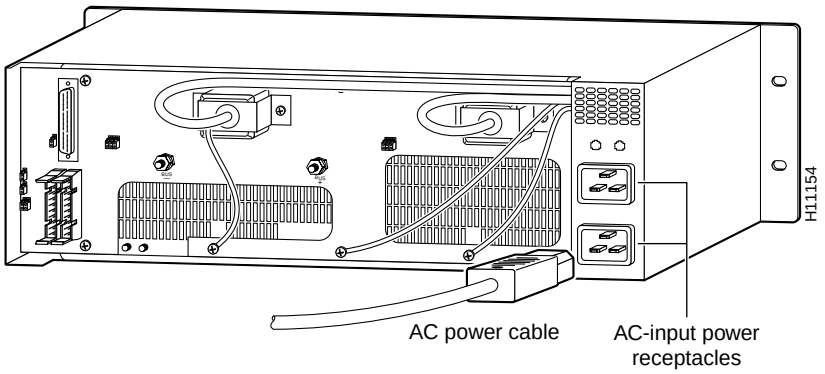
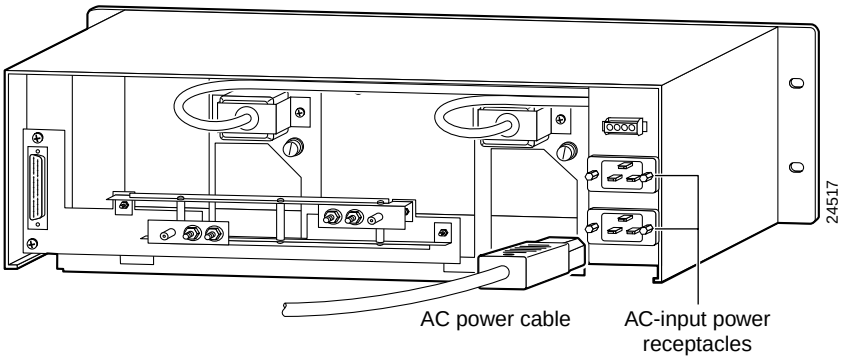


Figure 3-17 Connecting the AC Power Cords to an Enhanced Power Shelf



This completes the AC power cord installation.

Installing the Safety Cover on the Standard Power Shelf

For safety reasons, you must install the metal safety cover that shipped with your standard AC-input power shelf before you power up the system. The safety cover shields the power connections from possible short circuit and protects you from electrical shock.

Note This is not necessary with the enhanced power supply.

To install the safety cover, follow these steps:

Step 1 Align the metal safety cover with the grooves on the back underside of the dial shelf. (See Figure 3-18.)

Step 2 Slide the safety cover into place and attach the front of the cover to the dial shelf with the screws provided.

Caution The safety cover is an integral part of the product. Do not operate the standard AC power shelf without the safety cover installed. Operation of the unit without the safety cover in place will invalidate the safety approvals and pose a risk of fire and electrical hazards.

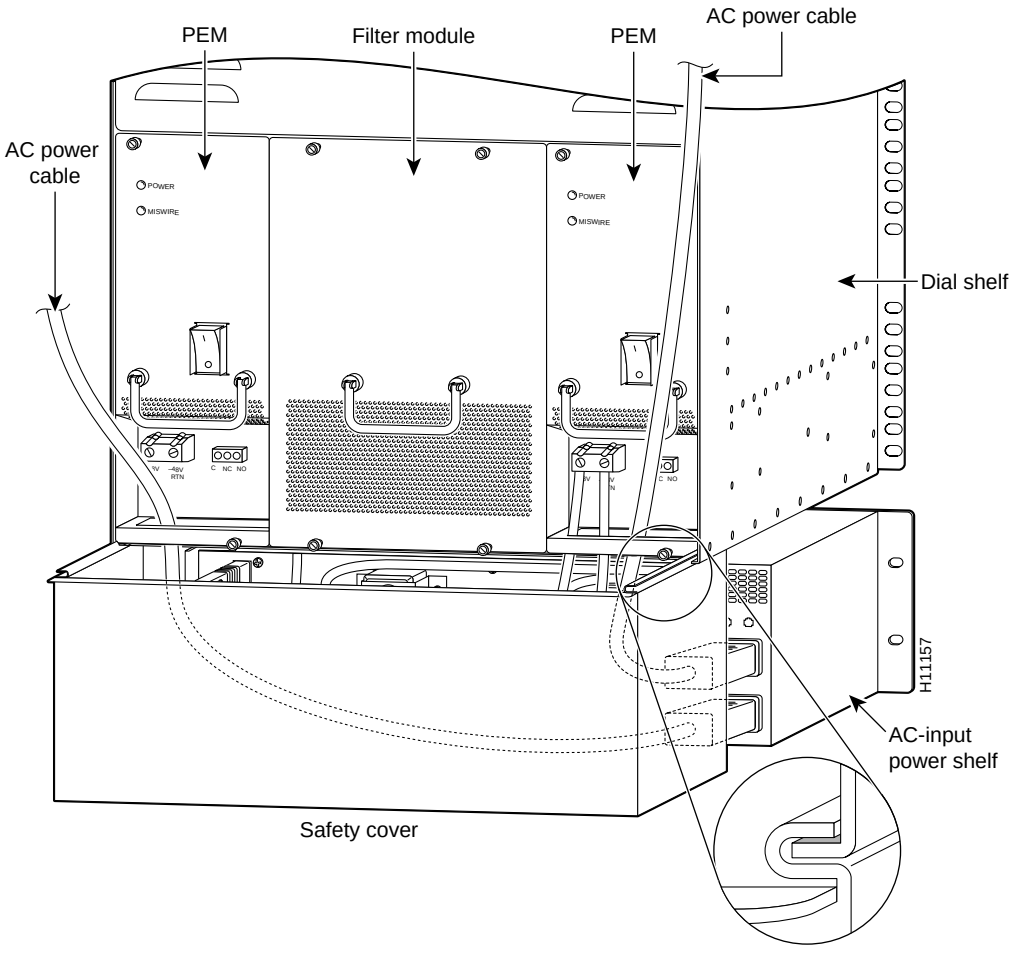
Warning The device is designed to work with TN power systems. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Step 3 Connect the opposite end of each power cord to a 220VAC power source.

Note For maximum redundancy, connect each power cord to a separate AC source.

Caution Do not plug the AC-input power shelf into the same power source as the router shelf or into the power strip on your equipment rack. The 20A connectors on the AC-input power shelf are incompatible with the power source used for the router shelf and with the 15A power strips used in most equipment racks.

Figure 3-18 Installing the Safety Cover to a Standard Power Shelf



Connecting to a DC Power Source

The following sections are for installations using a direct DC power source, without an AC-input power shelf.

Grounding the Dial Shelf

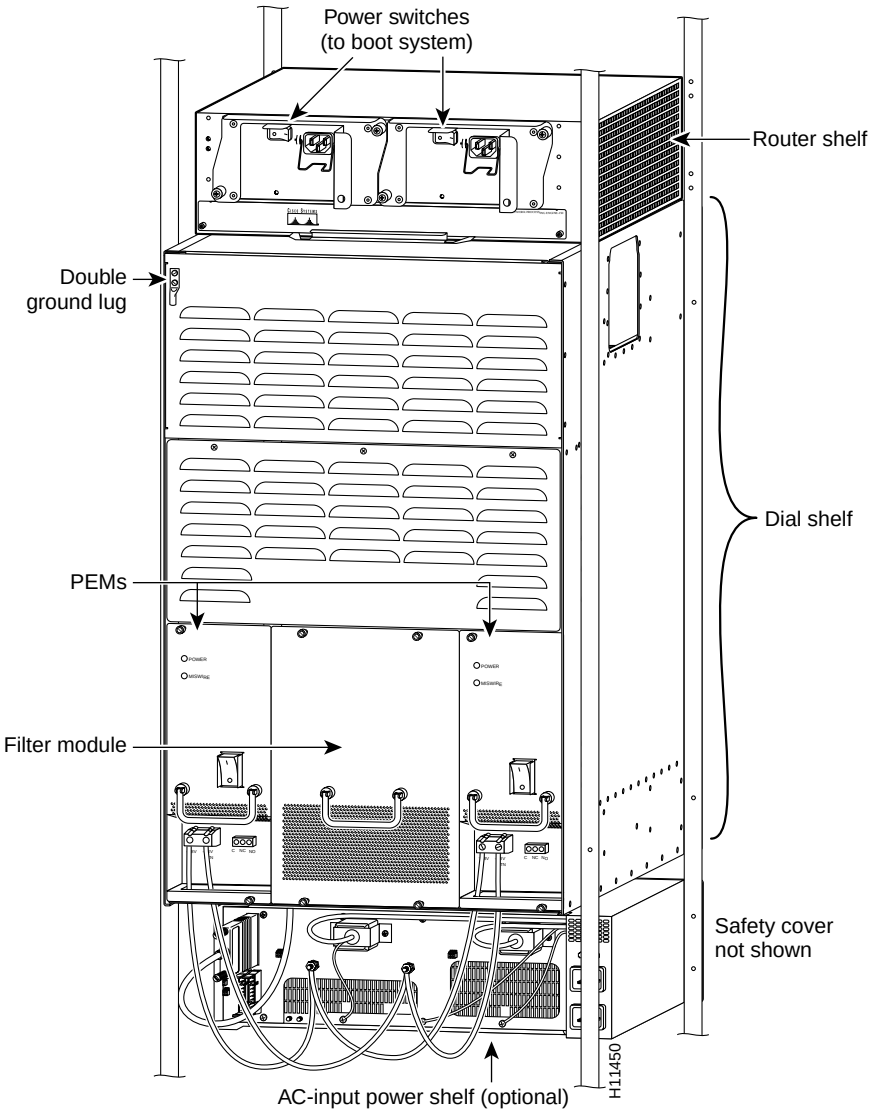
The Cisco 5814 dial shelf ships with a double ground lug attached to two pemnuts in the upper left corner on the rear of the dial shelf chassis. For detailed cabling specification information, refer to Appendix A, “Cisco AS5800 Specifications.” To ground the dial shelf, follow these steps:

Warning Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Warning When installing the unit, the ground connection must always be made first and disconnected last. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Step 1 Locate the dial shelf double ground lug (see Figure 3-19) and using a 1/4-in. flat-blade screwdriver, unscrew it from the chassis. Save the screws.

Figure 3-19 Cisco AS5800—Rear View



Step 2 Attach the double ground lug to your own 6-gauge ground wire.

Step 3 Using the screws you removed, fasten the ground lug to the dial shelf chassis.

Connecting DC Power Cables

If your site has access to a DC power source, you need to provide your own DC power cables. In the United States you need to use 6 AWG stranded or solid copper wire; elsewhere use 16 mm^2 solid or 10 mm^2 stranded copper wire.

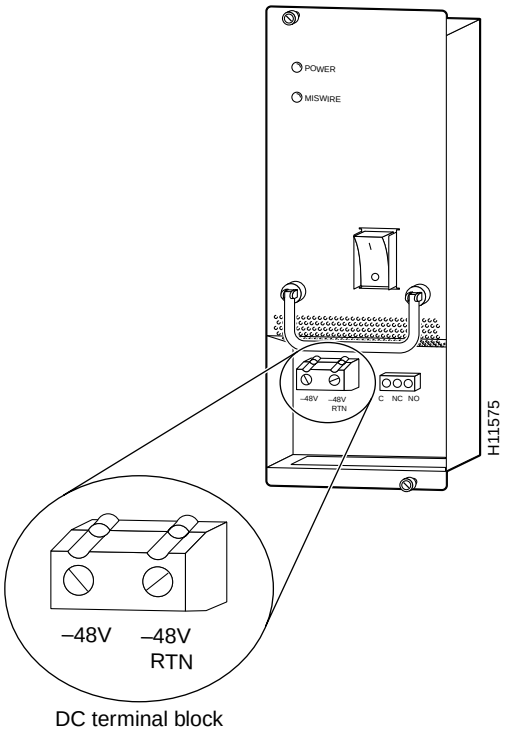
Complete the following cabling instructions:

Step 1 Locate the DC terminal block located on the dial shelf PEM front panel and loosen the connector screws using a 1/4-in. flat-blade screw driver. (See Figure 3-20.)

Step 2 Strip the DC power cable of its outer insulation to expose about 1/2-inch of copper wires.

Step 3 Connect the power cable stripped wires to the DC terminal block on the PEM and securely tighten the terminal block connector screws. (See Figure 3-20.)

Figure 3-20 DC Terminal Block on the PEM



Step 4 Connect the other end of your DC power cables to your DC power source.

Step 5 Repeat Step 1 through Step 4 to connect your DC power cables to the second PEM.

Note If the two DC conductors entering the PEM terminal block are reversed, a red warning LED on the PEM goes on to indicate a miswire. No damage will occur; however, you must power OFF the power at the source and reverse the connections.

This completes the procedure for installing the dial shelf in a rack. You are now ready to install the Cisco 7206 router shelf in the equipment rack.

Rack-Mounting the Router Shelf

The router shelf is intended to be rack-mounted above the dial shelf in the same rack; however, you can rack-mount the router shelf in an adjacent rack. The interconnect cable supplied by Cisco, which provides the physical connection between the router shelf and the dial shelf, is available in 6-ft or 20-ft lengths.

There is no clearance requirement for mounting the router shelf directly above the dial shelf. Use the rack-mounting brackets and cable-management kit that shipped with the Cisco 7206 router shelf to install the router in the rack.

Note To install the Cisco 7206 router shelf, refer to the *Cisco 7206 Installation and Configuration Guide* that shipped with your Cisco 7206 router shelf. After you complete the router shelf installation, you are ready to connect the cables. Proceed to the following section "Connecting the Dial Shelf to the Router Shelf."

Note It is possible to use two routers in a split dial shelf configuration with a single 5814 dial shelf. Install the second router shelf above the first.

Connecting the Dial Shelf to the Router Shelf

The Cisco 7206 router shelf contains a dial shelf interconnect port adapter with a single RJ-45 receptacle, which is used to connect the router shelf to the Cisco 5814 dial shelf. The interconnect port adapter installs in any 7206 router shelf port adapter slot and connects directly to the Cisco 5814 dial shelf controller card using a single full-duplex cable.

The cable used for this connection is available only from Cisco Systems. It is customized with shielding to decrease electromagnetic interference (EMI) emissions, and jackscrews to secure the connection. You must use this specially designed cable, which shipped with your interconnect port adapter, to connect the dial shelf to the router shelf. For detailed cabling specification information, refer to Appendix A, "Cisco AS5800 Specifications." If the cable was not shipped, contact CCO as described in the"Cisco Connection Online" section on page xiv.

Figure 3-21 shows the dial shelf interconnect cable with jackscrew connectors.

Figure 3-21 Dial Shelf Interconnect Cable

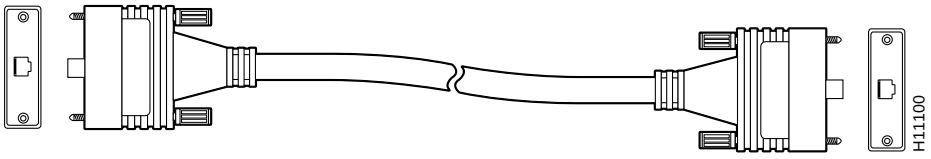
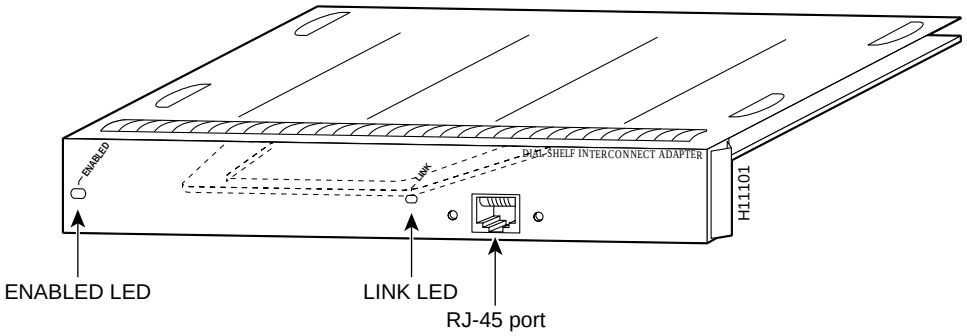


Figure 3-22 shows the RJ-45 receptacle on the dial shelf interconnect port adapter.

Figure 3-22 Dial Shelf Interconnect Port Adapter Front Panel



To connect the dial shelf interconnect cable, follow these steps:

Caution Do not use the dial shelf interconnect port adapter for outgoing WAN connections.

Warning Hazardous network voltages are present in WAN ports regardless of whether power to the unit is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the unit first. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Warning To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Step 1 Attach one end of the dial shelf interconnect cable directly to the RJ-45 port (See Figure 3-23) on the dial shelf interconnect port adapter in the Cisco 7206 router shelf.

Step 2 Tighten the jackscrews on either side of the connector.

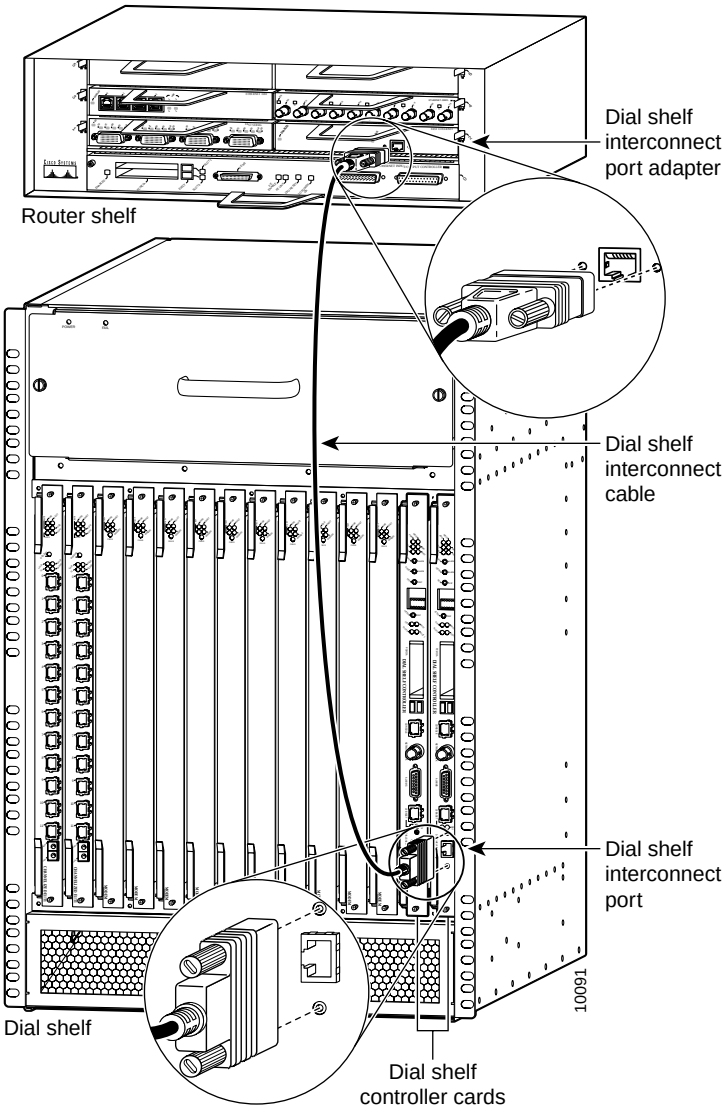
Step 3 Attach the other end of the cable to the port labeled “Dial Shelf Interconnect” on the dial shelf controller card front panel.

Step 4 Tighten the jackscrews on either side of the connector.

Step 5 If you will be using a split dial shelf configuration, repeat Step 1 through Step 4, connecting the second dial shelf controller card to the second router shelf.

Caution Never disconnect the interconnect cable while the system is operating (except when replacing a redundant dial shelf controller card), because you will lose all calls.

Figure 3-23 Connecting the Dial Shelf Interconnect Cable



Connecting Router Shelf Port Adapter Cables

Egress connections to LANs and WANs are made through the host Cisco 7206 router shelf. Using port adapters, the router shelf supports interfaces such as FDDI, HSSI, Fast Ethernet, and ATM. Each interface port adapter is shipped with separate configuration instructions and cable information.

For example, if you install a Fast Ethernet port adapter in the Cisco 7206 router shelf, refer to the configuration note *PA-FE-TX and PA-FE-FX Fast Ethernet 100BASE-T Port Adapter Installation and Configuration* (Part Number 78-2659-xx) that shipped with your Fast Ethernet port adapter. This document is also available in the Documentation CD-ROM and on Cisco Connection Online (CCO).

Connecting Trunk Card Cables

The trunk card provides 12 RJ-45 receptacles for channelized E1 or T1 lines, or BNC connectors for T3 trunk lines. To connect T1 or E1 trunk lines, follow these steps:

Warning The telecommunications lines must be disconnected 1) before unplugging the main power connector and/or 2) while the housing is open. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Warning Do not work on the system or connect or disconnect cables during periods of lightning activity.To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Warning Only trained and qualified personnel should be allowed to install or replace this equipment. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Warning The E1 interface card may only be installed in an ACA-permitted customer equipment or a Data Terminal Equipment (DTE) that is exempted from ACA's permit requirements. The customer equipment must only be housed in a cabinet that has screw-down lids to stop user access to overvoltages on the customer equipment. The customer equipment has circuitry that may have telecommunications network voltages on them.

Step 1 Attach one end of the T1 or E1 cable directly to the RJ-45 receptacle on the trunk card. (See Figure 3-24.)

Step 2 Attach the network end of your CT1 cable to your external network, or for CE1 cabling, attach the network end of your CE1 cable to your network termination (NT1) device.

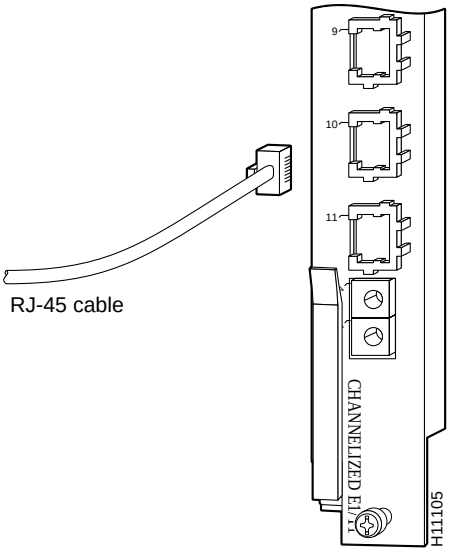
Step 3 Repeat Steps 1 and Step 2 for as many as 11 more T1 or E1 cables.

For more information about trunk cables and trunk cards, refer to the Cisco *AS5800 Universal Access Server Dial Shelf Card Guide*.

Warning

Warning Hazardous network voltages are present in WAN ports regardless of whether power to the unit is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the unit first. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Figure 3-24 Connecting the CT1 and CE1 Trunk Card RJ-45 Cables

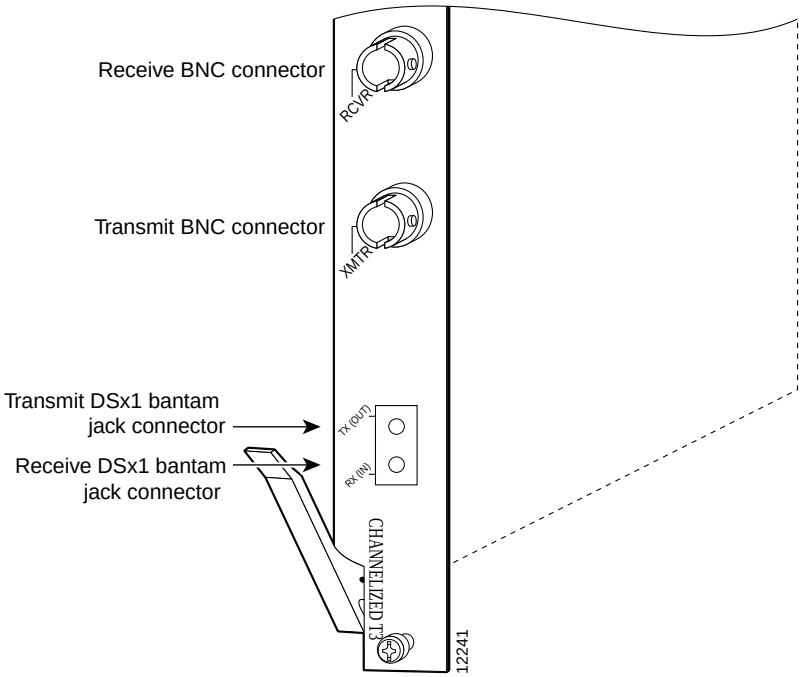


To connect the T3 lines, follow these steps:

Step 1 Attach the end of the T3 transmit and receive cables directly to the BNC receptacles on the trunk card (see Figure 3-25).

Step 2 Attach the network end of your CT3 cables to your external network.

Figure 3-25 CT3 Trunk Card BNC Cable Connections



Connecting to the Router Shelf Console and Auxiliary Ports

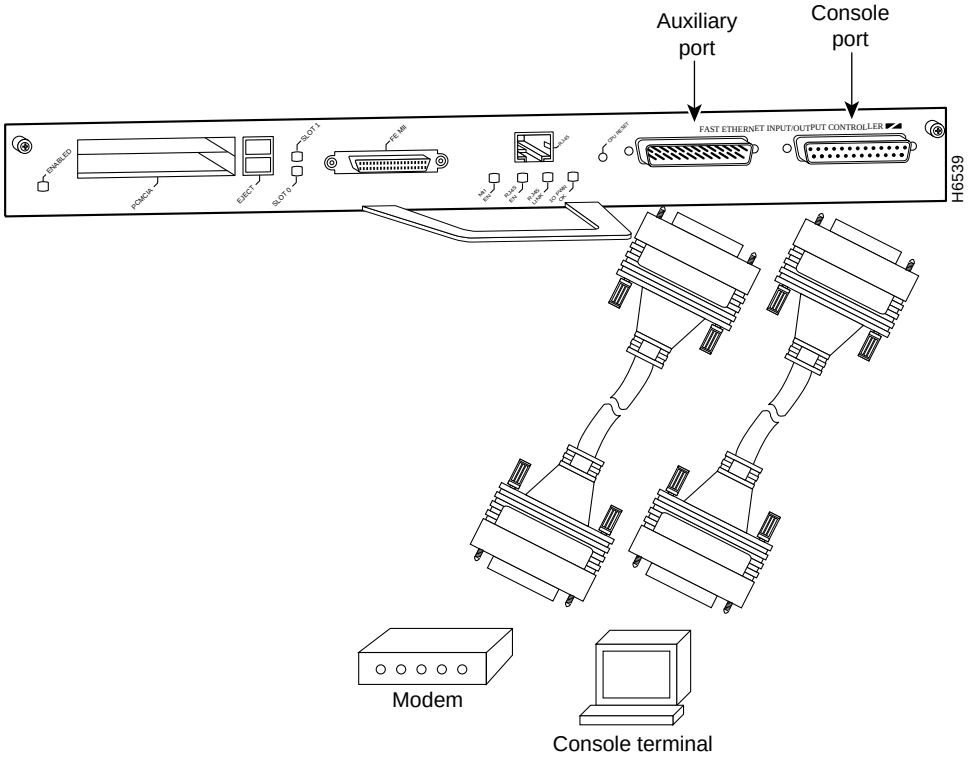
A DCE-mode console port and a DTE-mode auxiliary port are located on the router shelf I/O controller. The console port is a DB-25 receptacle for connecting a data terminal, which you use to run the initial setup script and bring up the Cisco AS5800. The auxiliary port is a DB-25 plug for connecting a modem or other DCE device (such as a CSU/DSU or other router) to the router shelf. (See Figure 3-26.)

Note Both console and auxiliary ports are asynchronous serial ports; any device connected to these ports must be capable of asynchronous transmission.

Before connecting a terminal to the console port, configure the terminal to match the router console port as follows: 9600 baud, 8 data bits, no parity, 2 stop bits (9600 8N2). You need an EIA/TIA-232 DCE console cable to connect the terminal to the console port. After you establish normal router operation, you can disconnect the terminal. While both the router shelf and the dial shelf have console ports, functions for both shelves are available from the router console port.

You must supply your own interface cable between the auxiliary port and the equipment you are connecting. Refer to the *Cisco 7206 Installation and Configuration Guide* that shipped with your router shelf for console and auxiliary port pinouts.

Figure 3-26 Connecting the Router Shelf Console and Auxiliary Ports



This completes the procedures for installing and cabling your Cisco AS5800. To start the access server, proceed to Chapter 4, “Powering On the Cisco AS5800 and Observing Initial Startup Conditions.”

Powering On the Cisco AS5800 and Observing Initial Startup Conditions

This chapter explains how to power on the Cisco AS5800 and confirm normal system startup LED readings, and then confirm that the proper software is running on the router shelf and dial shelf.

Powering On the Cisco AS5800

After you have installed your dial shelf and router shelf and connected the cables, you are ready to start up the system by powering on the following components:

- Dial shelf
- AC-input power shelf, if applicable
- Router shelf

Before you power on the Cisco AS5800, you might want to prepare a terminal connection to view the software startup sequence. See the "Connecting to the Router Shelf Console and Auxiliary Ports" section on page 3-31 for details on setting up a terminal connection. You should also confirm the LED indications as shown in the "Observing Access Server LEDs" section on page 4-3.

To power on the system, follow these steps:

Step 1 Power ON the circuit breakers for the circuits the Cisco AS5800 will use.

Step 2 If you are using the AC-input power shelf, power ON (|) the two power switches located on the AC-input power shelf front panel. (See Figure 4-1, or Figure 4-2 for the enhanced power supply.) Four green power OK LEDS should light.

Figure 4-1 AC-Input Power Shelf—Front View

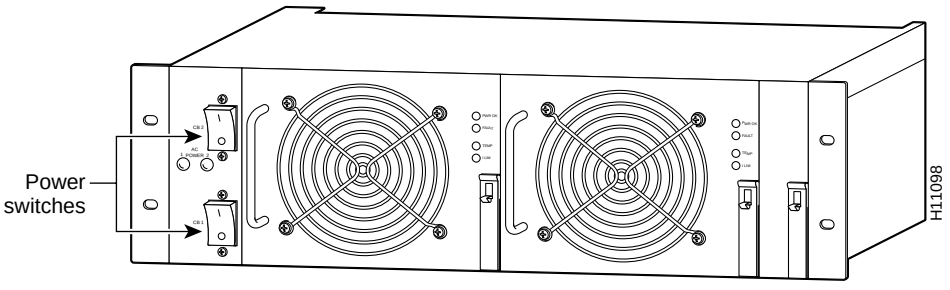
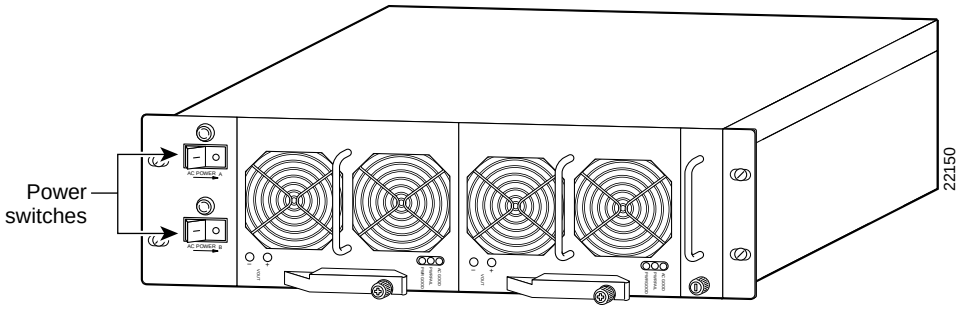
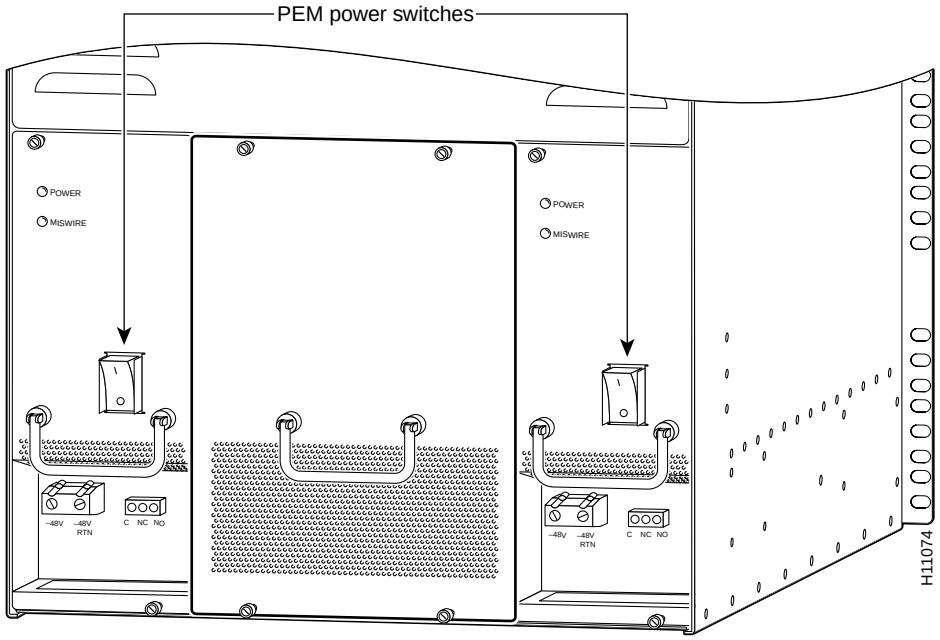


Figure 4-2 Enhanced AC-Input Power Shelf—Front View



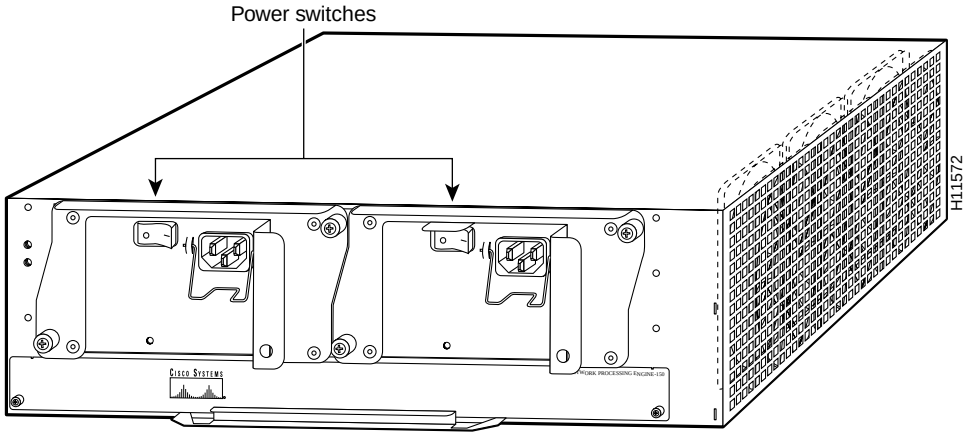
Step 3 Power ON (|) the power switches located on each dial shelf PEM front panel. (See Figure 4-3.) A green power LED on each PEM should light.

Figure 4-3 PEM Power Switches



Step 4 Power ON (|) the two power switches located on the rear of the router shelf. (See Figure 4-4.) Both green power supply OK LEDs should light.

Figure 4-4 Router Shelf Power Switches—Rear View



Step 5 Listen for fans in both the router shelf and the dial shelf. You should hear them operating immediately.

During the boot process, the LEDs on most of the port adapters in the router shelf and on the dial shelf cards and dial shelf controller cards light on and off in irregular sequence while the system is running initial self-diagnostic tests. On the router shelf I/O controller, the I/O power OK LED comes on immediately.

For a description of normal dial shelf LED states, proceed to the "Observing Access Server LEDs" section on page 4-3. Normal router shelf startup is discussed in the "Starting the Cisco 7206" section on page 4-8. If everything seems to be normal, complete the startup check with a console connection as described in the "Viewing Your System Configuration" section on page 4-10.

Observing Access Server LEDs

This section describes the normal LED states for the following components:

- Power-entry modules (PEMs)
- Dial shelf controller card
- Blower assembly
- Dial shelf interconnect port adapter

Nominal LED Readings

Table 4-1 provides a quick reference for nominal LED readings for Cisco AS5800 components. If LED readings vary from those listed, refer to the relevant sections for more details.

Table 4-1 AS 5800 Nominal LED Readings

Component	LED	Color/Condition
DC PEM	POWER	Green/on
	MISWIRE	Red/off
Dial Shelf Controller Card	PWR	Green/on
	MBUS	Green/on
	CLOCK	Green/on
	MAST	Green/on
	DSI	Green/on
Blower assembly	POWER	Green/on
	FAIL	Yellow/off
Router shelf port adapter	LINK	Green/on
	ENABLED	Green/on

Dial Shelf Card LEDs

LEDs for the individual CT1/CE1 trunk cards, DMM modem cards, and Voice over IP (VoIP) cards are described in the *Cisco AS5800 Universal Access Server Dial Shelf Card Guide*. Nominal LED readings are briefly listed in Table 4-2.

Table 4-2 Nominal LED Readings for Dial Shelf Cards

Dial Shelf Card	LED	Color/Condition
E1/T1Trunk	Power	Green/on
	HCPU	Green/on
	FCPU	Green/on
CT3 Trunk	Power	Green/on
	HCPU	Green/on
	FCPU	Green/on
DMM Modem	Power	Green/on
	HCPU	Green/on
	Modems	Green/on
VoIP	PWR	Green/on
	CPU OK	Green/on
	Ports OK	Green/on

Observing Power-Entry Module LEDs

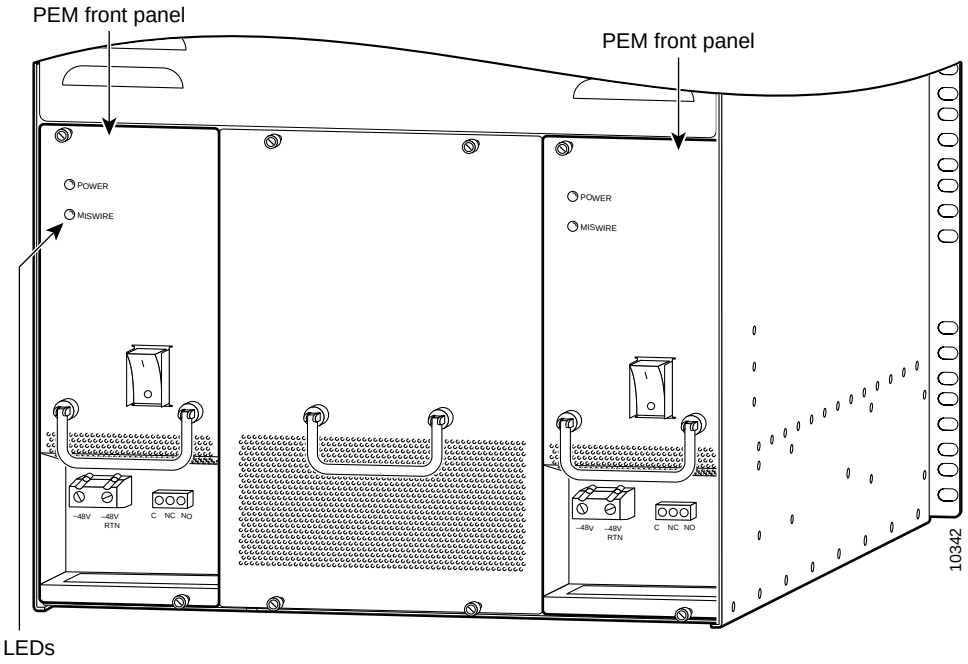
The PEMs contain two LEDs on the front panel—POWER and MISWIRE. (See Figure 4-5.)

- The power LED should light when the system is powered on. The LED indicates that input voltage is present and the PEM circuit breaker is on.
- The miswire LED should remain off, but lights when the two DC conductors entering the PEM terminal block are reversed.

If either of these LEDs functions abnormally, proceed to Chapter 5, “Hardware Troubleshooting.”

Figure 4-5 shows the location of the PEM LEDs.

Figure 4-5 PEM Front Panel LEDs



Observing Dial Shelf Controller Card LEDs

The dial shelf controller card front panel contains several LEDs. Unlike the other dial shelf cards installed in the Cisco 5814 dial shelf, the dial shelf controller card has two power LEDs, one for the dial shelf controller card power and the other for the system MBus power.

Figure 4-6 shows the dial shelf controller card front panel LEDs, and Table 4-3 describes the LED functions.

If the dial shelf controller card LEDs function abnormally, proceed to Chapter 5, “Hardware Troubleshooting.”

Figure 4-6 Dial Shelf Controller Card Front Panel LEDs

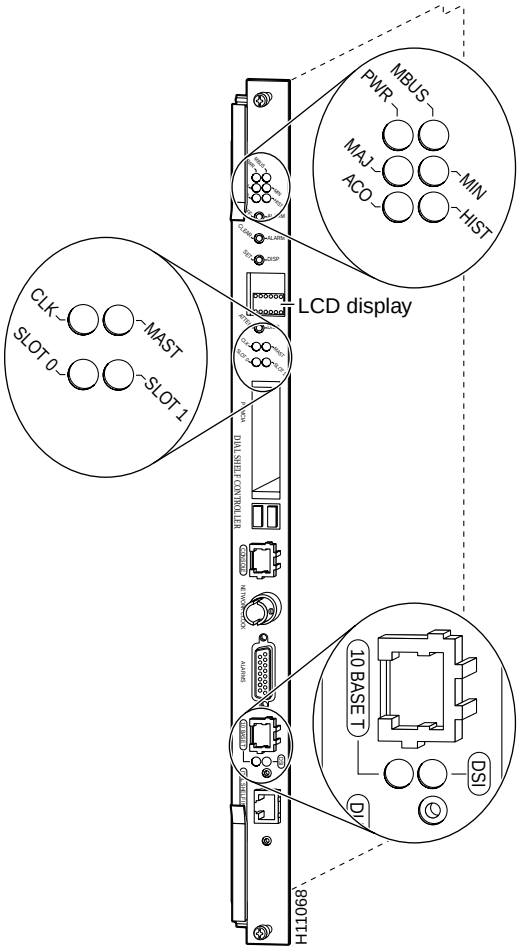


Table 4-3 Dial Shelf Controller Card Front Panel LEDs

LED Indicator	Display	Description
Power and Warning LEDs		
PWR (dial shelf controller power)	Green	Lights when power is ON.
MBUS (system MBus power)	Green	Lights when the dial shelf controller card is supplying +5 VDC to the system MBus.
MAJ (major alarm)	Yellow	Lights to indicate a major[1] alarm condition.
MIN (minor alarm)	Yellow	Lights to indicate a minor[2] alarm condition.
ACO (alarm cutoff)	Yellow	Lights when the alarm cutoff button has been pressed during a major or minor alarm. Turns off when the original alarm clears or any new alarm occurs.
HIST (history clear)	Yellow	Lights when software recognizes a major or minor alarm situation. LED powers off when the Clear Alarm button is pressed and no alarm condition remains.
Clock and Status LEDs		
CLK (clock)	Green	Lights to identify the dial shelf controller card active clock; active clock is independent from master dial shelf controller card designation.
MAST (master)	Green	Lights to indicate the system software recognizes the dial shelf controller card is in master mode.
Slot 0	Green	Lights when PCMCIA slot 0 is in use.
Slot 1	Green	Lights when PCMCIA slot 1 is in use.
DSI (dial shelf interconnect)	Green	Lights to indicate a working connection between the dial shelf and router shelf.
10BaseT (Ethernet link)	Green	Lights to indicate a working data transfer link connection between the access server and the system controller.
Liquid Crystal Displays		
LCDs (upper and lower)	Alphanumeric; 4 characters each	Displays MSTR to indicate master card.

1 A major alarm condition includes router shelf failure, backplane interconnect failure, two-fan failure, power supply failure, dial shelf card failure, or conditional environmental thresholds.

2 A minor alarm condition includes modem SIMM failure, HDLC controller failure, trunk line failure, or conditional environmental thresholds.

Blower Assembly LEDs

Two LEDs—Power and Fault—are mounted on the blower assembly front panel (see Figure 4-7) and function as described in Table 4-4.

Figure 4-7 Blower Assembly—Front View

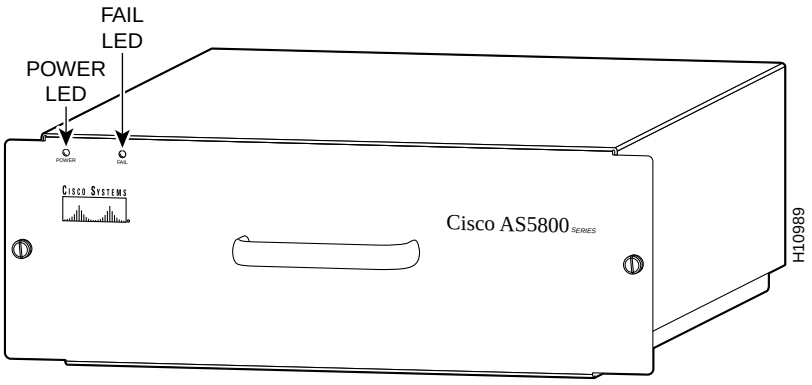


Table 4-4 Blower Assembly Front Panel LEDs

LED	Color	Description
POWER	Green	Indicates that all three fans are operating normally. If the power LED is off, either the blower assembly is not powered on or a fault has been detected in the blower assembly.
FAIL	Yellow	Remains off during normal operation. If the fault LED is on, one or more fans has failed. This failure could be a complete shutdown of one or more fans, or the blower assembly control card has detected that the speed of one or more fans has exceeded tolerance levels.

If you detect a problem with the blower assembly LEDs, proceed to Chapter 5, “Hardware Troubleshooting.”

Starting the Cisco 7206

After installing your Cisco 7206 and connecting the cables, start each router as follows:

Step 1 Check for the following:

- Each port adapter is inserted in its slot and its respective port adapter lever is in the locked position.
- The network processing engine and the I/O controller are inserted in their slots and their captive installation screws are tightened.
- All network interface cables are connected to the port adapters.
- A Flash memory card is installed in its PCMCIA slot.
- Each power cable is connected and secured with the cable-retention clip.
- The console terminal is turned on.

Step 2 At the rear of the router, place the power switch on the power supply in the ON (|) position. Repeat this if a second power supply is installed. The green OK LED on the power supply goes on.

Step 3 Listen for the fans; you should immediately hear them operating. If not, immediately place the power switch on the power supply in the OFF (0) position and proceed to the "Troubleshooting the Router Installation" section on page 5-6.

Step 4 During the boot process, observe the system LEDs. The LEDs on most of the port adapters go on and off in irregular sequence. Some may go on, go out, and go on again for a short time. On the I/O controller, the IO power OK LED comes on immediately.

Step 5 Observe the initialization process. When the system boot is complete (in a few seconds), the network processing engine begins to initialize the port adapters and the I/O controller. During this initialization, the LEDs on each port adapter behave differently (most flash on and off). The enabled LED on each port adapter goes on when initialization is completed, and the console screen displays a script and system banner similar to the following:

```
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C5800-p4-mz), 12.0(19970915:09303]
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Mon 01-Dec-99 06:00 by …
```

Note If the system does not complete each of the steps in the startup procedure, proceed to the "Troubleshooting the Router Installation" section on page 5-6 for troubleshooting recommendations and procedures.

Step 6 When you start up the Cisco 7206 for the first time, the system automatically enters the setup command facility, which determines which port adapters are installed and prompts you for configuration information for each one. On the console terminal, after the system displays the system banner and hardware configuration, you will see the following System Configuration Dialog prompt:

```
      --- System Configuration Dialog ---
At any point you may enter a questions mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.
Continue with configuration dialog? [yes]:
```

You have the option of proceeding with the setup command facility to configure the interfaces, or exiting from setup and using configuration commands to configure global (system-wide) and interface-specific parameters. You do not have to configure the interfaces immediately; however, you cannot enable the interfaces or connect them to any networks until you have configured them.

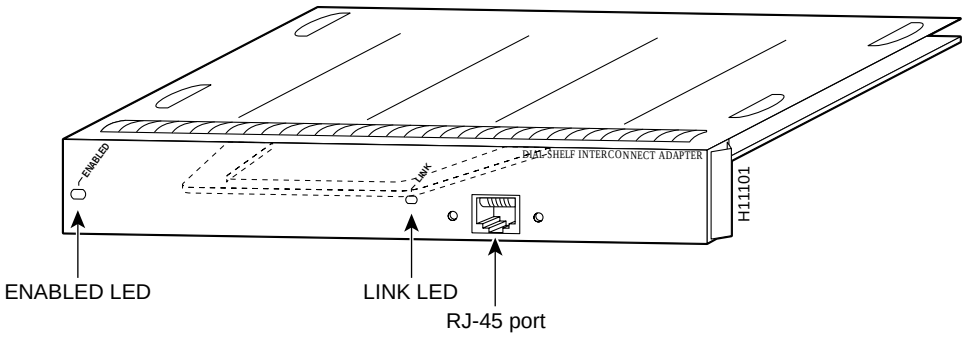
Many of the port adapter LEDs will not go on until you have configured the interfaces. To verify correct operation of each interface, complete the first-time startup procedures and configuration, then refer to the configuration note for each port adapter for LED descriptions and to check the status of the interfaces.

Observing Router Shelf Port Adapter LEDs

The router shelf port adapters contain enabled LEDs, which must be on for the system to be operational. Refer to the *Cisco 7206 Installation and Configuration Guide* for a description of router shelf port adapter LEDs.

Unique to the Cisco AS5800 is the interconnect port adapter that installs in the router shelf. The dial shelf interconnect contains two LEDs: an enabled LED and a link status LED, shown in Figure 4-8. After system initialization, the enabled LED lights to indicate that the dial shelf interconnect has been enabled for operation.

Figure 4-8 Dial Shelf Interconnect Port Adapter Front Panel



The following conditions must be met before the router shelf port adapters and the dial shelf interconnect are enabled:

- The dial shelf interconnect port adapter must be correctly connected to the router shelf midplane and receiving power.
- A valid Cisco IOS software image for the adapter has been downloaded successfully.
- The system recognizes the adapter.

If any of the above conditions are not met, or initialization fails for other reasons, the enabled LED will remain off. Refer to the chapter "Hardware Troubleshooting," later in this publication, for router shelf LED troubleshooting tips.

Viewing Your System Configuration

When you start up your access server for the first time, the router shelf console displays the Cisco IOS software information that is loaded on your system if you have connected a terminal as described in the "Connecting to the Router Shelf Console and Auxiliary Ports" section on page 3-31. From this startup software banner (see the following example), you can identify the Cisco IOS software release version, other platform images that support system component functionality, and installed internal hardware components.

```
System Bootstrap, Version 12.0(4)XJ, RELEASED SOFTWARE
Copyright (c) 1994-1999 by Cisco Systems, Inc.
AS5800 processor with 32768 Kbytes of main memory

Restricted Rights Legend

Use, duplication, or disclosure by the Government is
subject to restrictions as set forth in subparagraph
(c) of the Commercial Computer Software - Restricted
Rights clause at FAR sec. 52.227-19 and subparagraph
(c) (1) (ii) of the Rights in Technical Data and Computer
Software clause at DFARS sec. 252.227-7013.
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, California 95134-1706
```

```
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C5800-p4-mz), 12.0(19970915:09303]
Copyright (c) 1986-1999 by Cisco Systems, Inc.
Compiled Mon 01-Dec-99 06:00 by
Imagetext-base: 0x600088C0, data-base: 0x60940000

ROM: System Bootstrap, Version 12.0(4)XJ [dschwart 10], RELEASE SOFTWARE (fc1)

Cisco 7206 (NPE200) processor with 57344K/8192K bytes of memory.
R4700 processor, Implementation 33, Revision 1.0 (512KB Level 2 Cache)
Last reset from power-on
Channelized E1, Version 1.0.
X.25 software, Version 3.0.0.
Primary Rate ISDN software, Version 1.0.
4 Ethernet/IEEE 802.3 interface(s)
1 FastEthernet/IEEE 802.3 interface(s)
31 Serial network interface(s)
72 terminal line(s)
12 Channelized E1/PRI port(s)
1 FE interface(s) for dial shelf to router shelf interconnect
125K bytes of non-volatile configuration memory.
1024K bytes of packet SRAM memory.
16384K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0
```

Your Cisco AS5800 should be running the following software:

- Cisco IOS Release 12.04 XJ or later
- Router shelf image (c5800-p4-mz)
- Router shelf boot image (c5800-boot-mz)
- Dial shelf controller image (dsc-c5800-mz)

If you find you have a different Cisco IOS software release on the router shelf or dial shelf, reload the correct software version. If you need to reload the software, refer to the *Cisco AS5800 Software Installation and Configuration Guide* that shipped with your Cisco AS5800. The *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* will be replaced by the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide*, available later this year.

If you established a terminal connection after initial startup, you can verify that the correct software is loaded by issuing the following commands at the terminal:

Step 1 Enter the username and password:

```
User Access Verification

Username: admin
Password:
```

Step 2 Enter enable mode:

```
5800> enable
Password:
```

Step 3 View the router Cisco IOS release, dial shelf controller image, and boot image:

```
5800# sh ver
Cisco Internetwork Operating System Software
IOS (tm) 5800 Software (C5800-P4-M), Version 12.0(4)XJ
TAC:Home:SW:IOS:Specials for info
Copyright (c) 1986-1999 by Cisco Systems, Inc.
Compiled Thu 12-Aug-99 13:16 by ayeh
Image text-base: 0x60008900, data-base: 0x611A6000

ROM: System Bootstrap, Version 12.0(19990210:195103) [12.0XJ 105]
BOOTFLASH: 7200 Software (C7200-BOOT-M), Version 12.0(4)XJ

nas-5800-01 uptime is 22 minutes
System returned to ROM by power-on
System image file is "slot0:c5800-p4-mz.120-4.XJ1.bin"

Cisco 7206VXR (NPE300) processor with 253952K/40960K bytes of memory.
R7000 CPU at 262Mhz, Implementation 39, Rev 1.0, 256KB L2, 2048KB L3 Cache
6 slot VXR midplane, Version 2.0

Last reset from power-on
X.25 software, Version 3.0.0.
Bridging software.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
Primary Rate ISDN software, Version 1.1.
8 Ethernet/IEEE 802.3 interface(s)
1 FastEthernet/IEEE 802.3 interface(s)
52 Serial network interface(s)
288 terminal line(s)
12 Channelized T1/PRI port(s)
96 DSP(s), 192 Voice resource(s)
125K bytes of non-volatile configuration memory.

16384K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x102

5800#sh dial-shelf
Slot    Board     CPU       DRAM          I/O Memory   State         Elapsed
         Type     Util    Total (free)   Total (free)                Time
 0        CT1                 0(  0%)        0(  0%)  Resetting     00:03:20
 2 Modem(DMM)    0%/0%  46764800( 86%) 16777216( 74%)  Up            00:21:13
 3 Modem(DMM)    0%/0%  46764800( 86%) 16777216( 74%)  Up            00:21:13
 4      Voice    0%/0%  46764800( 91%) 16777216( 71%)  Up            00:21:12
12        DSC    0%/0%  19097792( 79%)  8388608( 66%)  Up            00:22:28
Dial shelf set for auto boot
```

Step 4 View the dial shelf controller image (must match the one listed on the router).

```
5800#execute-on slot 12 show ver

DA-Slot12>
Cisco Internetwork Operating System Software
IOS (tm) 5800 Software (C5800-DSC-M), Version 12.0(4)XJ
TAC:Home:SW:IOS:Specials for info
Copyright (c) 1986-1999 by Cisco Systems, Inc.
Compiled Thu 12-Aug-99 18:48 by ayeh
Image text-base: 0x600088F0, data-base: 0x60520000

ROM: System Bootstrap, Version 12.0(4)XJ SOFTWARE (fc)
ROM: 5800 Software (C5800-DSC-M), Version 12.0(4)XJ
```

```
DA-Slot12 uptime is 24 minutes
System returned to ROM by power-on
System image file is "slot0:dsc-c5800-mz.120-4.XJ1.bin"

Cisco c5800 (R4K) processor with 24576K/8192K bytes of memory.
R4700 CPU at 150Mhz, Implementation 33, Rev 1.0, 512KB L2 Cache
Last reset from power-on
1 Ethernet/IEEE 802.3 interface(s)
2 Dial Shelf Interconnect(DSI) FE interface(s)
123K bytes of non-volatile configuration memory.

8192K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x2102
```

Refer to the *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* that shipped with your system for additional software configuration information. The *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* will be replaced by the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide,* available later this year.

Where to Go Next

Your access server is now installed, and all components are operative. When you power ON the access server for the first time, messages appear on your console screen. When the initialization process is complete, the console screen displays a script and system banner. At this point, you can begin to configure the software. The software configuration information is contained in the *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide.* Proceed to this publication for information on how to run the initial setup script and create a basic configuration.The *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide* will be replaced by the *Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide,* available later this year. The *Cisco AS5800 Universal Access Server Operations, Administration, Maintenance, and Provisioning Guide* provides information needed for ongoing hardware and software maintenance and operation tasks.

The remainder of this document includes reference material for troubleshooting your system and Cisco AS5800 specifications.

CHAPTER 5

Hardware Troubleshooting

Your Cisco AS5800 was thoroughly tested before leaving the factory. If you encounter problems initializing system startup, use the information in this chapter to help isolate the cause.

This chapter contains the following sections:

- Problem Solving with Subsystems
- Identifying Startup Problems
- Troubleshooting the Power Subsystems
- Troubleshooting the Cooling Subsystems
- Troubleshooting the Processor Subsystems
- Troubleshooting Network Interfaces

The procedures in this chapter assume that you are troubleshooting the initial hardware configuration and system startup. If you have removed or replaced components or changed any default settings, the recommendations in this chapter might not apply. Review the safety warnings listed in the publication *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information* before using the troubleshooting procedures in this chapter.

If you are unable to resolve the problem, contact a customer service representative for assistance and further instructions. Provide the representative with the following information:

- Date you received the system
- Chassis serial number
- Type of software and release number
- Brief description of the problem
- Brief explanation of the steps you have taken to isolate and resolve the problem
- Maintenance agreement or warranty information

Problem Solving with Subsystems

The key to problem solving is isolating the problem to a specific subsystem. The first step in solving startup problems is to compare what the system *is doing* to what it *should be doing*. Try to isolate the problem to one of the following three router shelf or dial shelf subsystems:

- Power
- Cooling
- Processor

Start by checking the router shelf power components. If the problem does not seem to originate there, check the dial shelf power components.

Router shelf power components include the following:

- AC-input or DC-input power supplies
- Cisco 7206 router shelf midplane
- External-power cable connection

Dial shelf power components include the following:

- Power-entry modules (PEMs)
- Filter module
- AC-input power shelf
- Cisco 5814 dial shelf backplane
- External-power cable connection
- External monitor system

Next, check the router shelf cooling components. If the problem does not seem to originate there, check the dial shelf cooling components. Router shelf and dial shelf fans should all be operating whenever system power is on.

- Router shelf cooling components include the fan tray.
- Dial shelf cooling components include the blower assembly.

Last, check the router shelf processor cards. If the problem does not seem to originate there, check the dial shelf processor cards.

Most processor cards contain LEDs that indicate the status of the card. Observing these LEDs can help you isolate the problem to a particular card. (See Chapter 4, “Powering On the Cisco AS5800 and Observing Initial Startup Conditions,” for LED descriptions and troubleshooting tips.)

The system memory and management functions reside on the router shelf I/O controller card and the network processor card. The enabled LED on each port adapter lights when the port adapter is initialized. A port adapter that is partially plugged into the midplane can cause the system to hang and crash.

The router shelf processor subsystem includes the following:

- I/O controller card
- Network processor card
- Dial shelf interconnect port adapter
- Other port adapters

Dial shelf processor cards include the following:

- Dial shelf controller card
- Modem cards
- Trunk cards

The following sections will help you isolate a problem within one of these subsystems and direct you to the appropriate troubleshooting section.

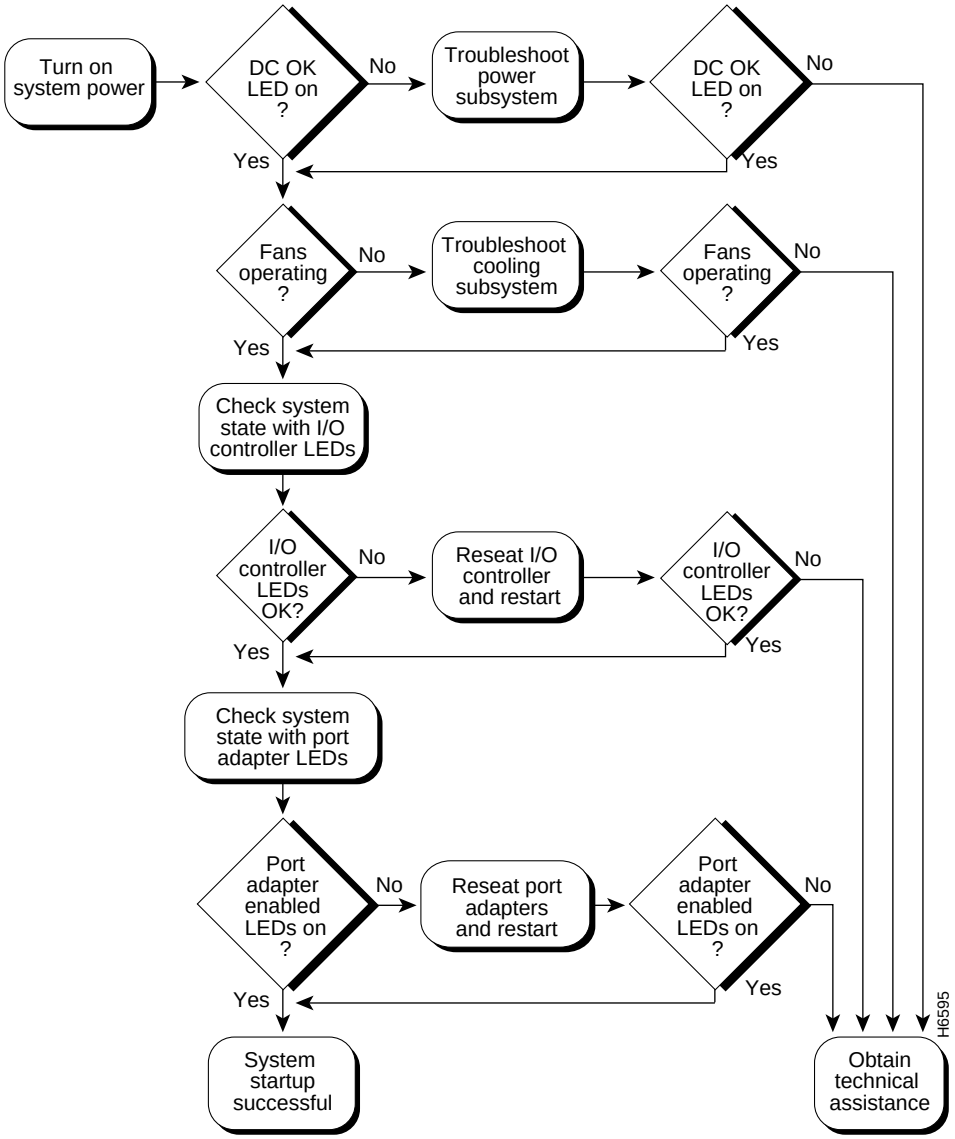
Problem Solving with Subsystems—Cisco 7206 Router

The key to solving problems with the system is isolating the problem to a specific subsystem. The first step in solving startup problems is to compare what the system is doing to what it should be doing. Because a startup problem is usually caused by a single component, it is more efficient to isolate the problem to a subsystem rather than to troubleshoot each component in the system. For these troubleshooting procedures, consider the following subsystems:

- Power subsystem—This subsystem comprises the power supplies, the external power cable, and the midplane.
- Cooling subsystem—The chassis fan tray is the single component in this subsystem. The fans should be operating whenever system power is on. Replace the fan tray if you determine that a fan is not functioning properly.
- Processor subsystem—This subsystem includes the I/O controller, network processing engine, and all port adapters. The system memory and management functions reside on the I/O controller and the network processing engine. The enabled LED on each port adapter indicates whether the port adapter is initialized. A port adapter that is partially installed in the midplane can cause the system to hang and crash.

You can quickly verify that your new router shelf is properly installed and operative by observing the router LEDs as described in the “Starting the Cisco 7206” section on page 4-8.

Figure 5-1 Troubleshooting Strategy for Startup Problems



Identifying Startup Problems

Hardware startup problems are commonly traced to cabling problems or incorrectly installed power supplies or cards. In rare cases, problems are caused by part failures.

When you start up a Cisco AS5800 for the first time, you should observe the startup sequence, described in the following sections. This chapter describes the normal startup sequence for the router shelf and the dial shelf and the steps to take if the system does *not* perform that sequence as expected.

In most cases, LEDs indicate system states in the startup sequence. By checking these LEDs, you can determine when and where the system failed. Use the following descriptions to isolate the problem to a subsystem, then proceed to the appropriate sections to try to resolve the problem.

Note Although an overtemperature condition is unlikely at initial startup, the environmental monitoring functions are included in this chapter because these functions also monitor internal voltages.

Starting Up the Cisco 7206 Router Shelf

When you first power ON the router shelf power supply, the following should occur:

- The power supply LEDs (OK) should light immediately when you set the power supply switch to the ON (|) position and remain lit during normal system operation.

  If the power OK LEDs *do not* light, proceed to the section "Troubleshooting the Power Subsystems."

- You should immediately hear the fans operating.

  If the fans do not operate, proceed to the section "Troubleshooting the Cooling Subsystems."

- The I/O controller card LEDs should light in the following sequence. If they do not light as described, proceed to the section "Troubleshooting the Processor Subsystems."

  — The I/O power OK LED lights immediately and indicates that the I/O controller card is receiving DC power from the router midplane. This LED lights during a successful router boot and remains on during normal operation of the router.

  — The enabled LED lights after the I/O power OK LED and indicates that the network processor card and the I/O controller card are enabled for operation by the system; however, that the enabled LED lights does not mean that the Fast Ethernet port on the I/O controller card is functional or enabled. This LED lights during a successful router boot and remains lit during normal router operation.

  — The FE enabled LED lights after the enabled LED and indicates that the Fast Ethernet port on the I/O controller card is initialized and enabled for operation by the system. This LED lights during a successful router boot and remains lit during normal router operation.

  — The FE link LED lights only when the Fast Ethernet port on the I/O controller card is receiving a carrier signal from the network. (This LED remains off during normal router operation unless there is an incoming carrier signal and does not indicate startup problems.)

  — The slot 1 and slot 2 LEDs light after the enabled LED and indicate which PCMCIA slot is in use.

    During a successful router boot, these LEDs light and remain on if a Flash memory card is present in the slot. These LEDs also blink when either slot is being accessed by the system. These LEDs do not indicate startup problems.

- The port-adapter-enabled LEDs each light when the network processor card completes its initialization of the port adapter for operation.

  The enabled LED indicates that the port adapter is receiving power and has been recognized by the network processor card; it does not indicate the state of the individual port adapter interfaces.

  If an enabled LED does not light, proceed to the section "Troubleshooting the Port Adapters," later in this chapter.

- The dial shelf interconnect port adapter link status LED lights.

  The link status LED indicates an active connection to the dial shelf and lights when the interconnect port adapter is receiving a carrier signal from the dial shelf controller card. This LED should light and remain on when the access server is operating.

  If the interconnect port adapter link LED does not light, proceed to the section, "Troubleshooting the Dial Shelf Interconnect Port Adapter."

- When all router shelf LEDs light to indicate that the system has booted successfully, the initial system banner should be displayed on the router shelf console screen. If it is not displayed, verify that the terminal is set correctly and is properly connected to the I/O controller card console port as described in the "Connecting to the Router Shelf Console and Auxiliary Ports" section on page 3-31.

Troubleshooting the Router Installation

Your Cisco 7206 routers went through extensive testing before leaving the factory. However, if you encounter problems starting the routers, use the information in the chapter "Troubleshooting the Installation" in the *Cisco 7206 Installation and Configuration Guide* (Document Number DOC-7206-ICG=) to help isolate the cause of the problems. Be sure to review the safety warnings listed in the publication *Regulatory Compliance and Safety Information for the Cisco 7200 Series Routers* (Part Number 78-3419-xx) that accompanied your Cisco 7206 before using troubleshooting procedures.

If you are unable to easily solve the problem, contact a customer service representative for assistance and further instructions. Be prepared to provide the representative with the following information:

- Date you received the router
- Chassis serial number
- Type of software and release number
- Brief description of the problem you are having
- Brief explanation of the steps you have taken to isolate and resolve the problem
- Maintenance agreement or warranty information

Figure 5-1 shows the general troubleshooting strategy for Cisco 7206 routers. Refer to this chart, as necessary, to isolate problems to a specific subsystem; then resolve the problem if possible.

Starting Up the Cisco 5814 Dial Shelf

When you first power ON the dial shelf, the following should occur:

- Both PEM power LEDs should light immediately and remain on during normal system operation. If you are using the AC-input power shelf, both AC-input power supply LEDs should light.

  If the green power LEDs *do not* light, proceed to the section "Troubleshooting the Power Subsystem."

- You should hear the fans operating in the blower assembly.

  If the fans do not operate, proceed to the section "Troubleshooting the Cooling Subsystems."

- The LEDs on the dial shelf controller card, modem cards, and trunk cards should light as follows:

— Dial shelf controller card—Powers ON first, followed by remaining logic cards. The PWR and MBus LEDs should light. The remaining four alarm LEDs should all briefly flash on and then turn off.

  If the MBus LED remains off but the power LED is on, there might be a problem with the MBus power supply on the card. Replace the card.

— Trunk card—At initial power ON, all LEDs light while the system runs a series of diagnostics. After the system passes initial diagnostics, all LEDs go off. The power, host CPU, and framer CPU LEDs then light to indicate that the trunk card is operating properly.

— Modem card—During normal operation, all five LEDs light at system power up. When the modem card CPU software image starts running, it shuts off the modem LED. The power, host CPU, and modem LEDs then light to indicate that the modem card has passed diagnostics and is operating properly.

If the dial shelf processor component LEDs do not light as described, proceed to the section "Troubleshooting the Processor Subsystems."

Troubleshooting the Power Subsystems

The Cisco AS5800 is designed to minimize problems in the power subsystem. The power subsystem includes the router shelf power supplies, the dial shelf PEMs and filter module, and the AC-input power shelf (if used).

The access server comes with two DC power supplies in both the router shelf and the dial shelf, which allow you to replace power supplies while the system is operating. However, if you are using an AC-configured system and you discover a faulty PEM, you must power off the system before performing a replacement.

Caution If your system requires the AC-input power shelf for AC-to-DC conversion, you should schedule a time for system maintenance and replace the PEM at that time. Refer to the document *AC-Input Power Shelf and Power Supply Installation and Replacement* (Part Number 78-4659-xx) for installation and replacement instructions.

The failure of a single power supply in the router shelf, the dial shelf, or the AC-input power shelf, if used, will not stop the access server from operating; however, to maintain power redundancy, both power supplies in each unit must be receiving power.

Router Shelf Power Subsystem

In the router shelf, check the following to help isolate a problem with the power subsystem:

- Is the power OK LED on?
  - — If yes, the power source is good and the power supply is functional.
  - — If no, verify that the power cable is connected at both ends.

    If the power OK LED remains off and the power switch is set correctly, suspect the power source or the power cable. Power OFF the system, connect the power cable to another power source, if available, then power ON the system. If the LED lights, the problem is the first power source.
  - — If the power OK LED does not light after you connect the power supply to a new power source, replace the power cord, then power ON the system. If the AC power (or input power) LED lights, return the first power cable for replacement.
  - — If the LED still does not light when the power supply is connected to a different power source with a new power cable, the power supply is probably faulty. If a second power supply is available, install it in the other power supply bay and contact a service representative for further instructions.
- Is the power OK LED on for the second (redundant) power supply?
  - — If yes, proceed to the section “Troubleshooting the Cooling Subsystems.”
  - — If no, repeat each of the above procedures for the second power supply.

  If you are unable to resolve the problem or you determine that either a power supply or chassis connector is faulty, contact a service representative for instructions.

Dial Shelf Power Subsystem

In the dial shelf, check the following to help isolate a problem with the power subsystem:

- Is the first PEM power OK LED on?
  - — If yes, the power source is good and the PEM is functional. Verify that the second PEM power LED is on for power redundancy.
  - — If no, verify that the power cable is connected at both ends and check that you have wired the DC-input connections correctly.

    If the DC-input connection is wired correctly, the miswire LED remains off.

    If the miswire LED is on, the two DC conductors entering the PEM terminal block are reversed. Power OFF the power at your power source and reverse the connections.
  - — If neither the power nor the miswire LED is on, check the voltage at the input terminal block. If the voltage reading falls between –40 VDC and –60 VDC, replace the PEM.
- If you are using the AC-input power shelf, are both power OK LEDs on?
  - — If yes, the power source is good and both power supplies are functional.
  - — If no, verify that the associated AC power cord is plugged in and the correct AC voltage (200 to 240 VAC) is present at the source.
  - — Verify that the fault LED is off.

    If a power supply fault LED lights, the power shelf has detected an internal fault; the power supply is defective. You need to replace the power supply.

— Verify that the overtemperature LED is off.

If a power supply overtemperature LED lights, verify that the ambient temperature is below 120°F (50°C) and the air intake is not blocked. If the condition persists, replace the power supply.

— Verify that the current limit LED is off.

If a power supply current limit LED lights, verify that the DC bus terminals on the AC-input power shelf rear are not short-circuited and a supported dial shelf configuration is being used.

Note The dial shelf power subsystem supports a maximum configuration of 10 modem cards.

Troubleshooting the Cooling Subsystems

The Cisco AS5800 is designed to minimize problems in the cooling subsystem. The access server can operate in temperatures of up to 120°F (50°C) for a maximum of 72 hours. The access server also contains rendundant fans in both the router shelf fan tray and the dial shelf blower assembly, which allow the system to continue operating despite a single fan failure. Both the router shelf fan tray and the dial shelf blower assembly can be removed and replaced while the system is operating, provided the procedure does not exceed 1 min.

Router Shelf Cooling Subsystem

In the router shelf, check the following to help isolate a problem with the cooling subsystem:

- When you start up the system, do the router shelf fans operate?

  To determine whether the router shelf fans are operating, listen for them. In noisy environments, place your hand on the left side of the router shelf (when viewing the router shelf from the front) to feel for air being forced out the vents.

  — If yes, power to the fans is good.

  — If no, there is a problem with the router shelf fans or there is a problem with the power to the fan tray.

  If you determine that the power supply is functioning normally but a fan is faulty, you can replace the fan tray without powering off the access server. Contact a customer service representative if you need assistance.

  For problems with the system power, refer to the section “Troubleshooting the Power Subsystem” in this chapter.

Dial Shelf Cooling Subsystem

In the dial shelf, check the following to help isolate a problem with the cooling system:

- Do the blower assembly fans operate?

  To determine whether the dial shelf fans are operating, listen for them. In noisy environments, place your hand under the exhaust vents on the back of the dial shelf blower assembly to feel for air being forced out the vents.

  — If no, there is a problem with the dial shelf fans or there is a problem with the power to the blower assembly.

  If you determine that the power supply is functioning normally but a fan is faulty, you can replace the blower assembly without powering off the access server. Refer to the blower assembly removal instructions in Chapter 2, “Preparing for Installation,”and the reinsertion instructions in Chapter 3, “Installing the Cisco AS5800.” For problems with the system power, refer to the section “Troubleshooting the Power Subsystem” in this chapter.

- Is the green power LED on the blower assembly front panel on?

  If no, verify that the blower assembly is fully installed in the dial shelf, the connector is firmly connected to the backplane, and the captive screws are tightened adequately.

- Is the yellow fault LED on the blower assembly front panel on?

  If yes, the newly installed blower assembly might be faulty or the chassis connector might be damaged. Shut off system power, remove the blower assembly from the dial shelf, and check the connectors. If the connectors are in good condition, reinstall the blower assembly in the dial shelf and power ON the system. If the fault LED is still on, assume that the blower assembly is faulty. Install another blower assembly and return the faulty blower assembly to the factory.

- The following error message, if displayed on the router shelf console, indicates that the system has detected an overtemperature condition or out-of-tolerance power somewhere in the system.

  ```
  Queued messages:
  %ENVM-1-SHUTDOWN: Environmental Monitor initiated shutdown
  ```

  If an environmental shutdown results from an out-of-tolerance power condition, the router shelf power OK LED remains off and the system shuts down. (Refer to the section “Troubleshooting the Power Subsystems” in this chapter.) Although an overtemperature condition is unlikely at initial startup, ensure that heated exhaust air from other equipment is not entering the router’s inlet vent and that there is sufficient clearance around the sides of the chassis to allow cooling air to flow. Refer to the “Preventive Site Configuration: Maintaining Normal Operation” section on page 2-20” for preventive site configurations.

  The above message could also indicate a faulty component or temperature sensor. Before the system shuts down, use the **show environment** or **show environment table** command to display the internal chassis environment. Refer to the *Cisco 7206 Installation and Configuration Guide* for a description of **show** commands.

Troubleshooting the Processor Subsystems

The processor subsystem consists of the I/O controller card, network processor card, and all port adapters in the router shelf, and the dial shelf controller card, modem cards, and trunk cards in the dial shelf. The following sections contain specific troubleshooting information for each of these components.

The router shelf I/O controller card and network processor card are required system components. The system cannot operate unless the I/O controller card and network processor card are installed properly; however, the system can operate without any port adapters installed as long as none are in *partial* contact with the midplane pins. A port adapter that is partially connected to the midplane causes the router shelf to crash or to hang. Therefore, first ensure that the I/O controller card and the network processor card are installed properly and that the system software has initialized successfully. Then, if necessary, you can troubleshoot individual router shelf port adapters, dial shelf controller cards, modem cards, or trunk cards.

Troubleshooting the Router Shelf Processor Subsystem

The following sections describe troubleshooting procedures for the router shelf I/O controller card, the network processor card, and the port adapters.

Troubleshooting the I/O Controller Card

These procedures assume that the I/O controller card, network processor card, and router shelf itself are in the original factory configuration and that you have not made changes to your configuration file.

If the I/O controller card LEDs do not light as expected (refer to the section “Identifying Startup Problems” in this chapter), check the following items to help isolate the problem:

- Is the I/O power OK LED on?
  - If yes, the router has booted successfully.
  - If this LED remains OFF at system startup, either there is a problem with the power supply (it is damaged or not connected to the router midplane), or the network processor card or I/O controller card is not connected to the router midplane.
- Do all I/O controller card LEDs remain off when the system powers ON?
  - If the LEDs remain off, first refer to the sections “Troubleshooting the Power Subsystems” and “Troubleshooting the Cooling Subsystems” in this chapter to ensure that both the fans and the power supply are functioning properly.
  - If the power supply and fans appear operational but none of the I/O controller card LEDs are on, ensure that an improperly connected I/O controller card or port adapter has not hung the system. Tighten all captive installation screws, and then restart the system.
  - With the power supply powered OFF, reseat the I/O controller card in its slot and restart the router.
- Is the I/O controller card enabled LED on?
  - If yes, the system software has initialized successfully and the system is operational.
  - If the enabled LED remains off, the system detected a processor hardware failure. (This LED should be on in normal operation.) Proceed to the section “Troubleshooting the Network Processor Card” to continue troubleshooting.

- Is the FE ENABLED LED on?
  - If yes, the Fast Ethernet port on the I/O controller is initialized and enabled for operation.
  - If the FE enabled LED remains off at system startup, there is probably a problem with the Fast Ethernet port on the I/O controller.

Troubleshooting the Network Processor Card

These procedures assume that the I/O controller card, network processor card, and router shelf are in the original factory configuration and that you have not made changes to your configuration file.

- Is the I/O controller card enabled LED on? (This LED should light in normal operation.)
  - If the I/O controller card enabled LED does not light as expected and you have checked the I/O controller card, make sure that the power to the router is OFF, reseat the network processor card in its slot, and restart the router.
  - If the enabled LED remains off, the system detected a processor hardware failure. Ensure that a partially seated port adapter is not causing the system to hang. Proceed to the following section, "Troubleshooting the Port Adapters."

Troubleshooting the Port Adapters

Check the following to help isolate a problem with the port adapters:

- Are *all* port adapter enabled LEDs on?

  If yes, the system is operational.
- Are *any* port adapter enabled LEDs off?
  - If the enabled LED on an individual port adapter is off, suspect that the port adapter has pulled away from the midplane. Reseat the port adapter in its slot and verify that the port adapter levers are in the locked position. (You do not have to power OFF system power when removing or replacing port adapters.) After the system reinitializes the interfaces, the enabled LED on the port adapter should light.
  - If the enabled LED remains off, suspect a faulty port adapter. Replace the port adapter with a new one.

    If the new port adapter enable LED fails to light, there may be a problem with the I/O controller card or the network processor card. Contact a service representative for instructions.

Troubleshooting the Dial Shelf Interconnect Port Adapter

Check the following to help isolate a problem with the interconnect port adapter:

- Is the dial shelf interconnect port adapter enabled LED on?
  - If yes, the system is operational.
  - If no, verify that the interconnect port adapter is seated properly and that the port adapter levers are in the locked position.

    If the enabled LED remains off, reseat the port adapter and verify that the port adapter levers are in the locked position. Use the **reload** command to reload the system software.
  - If the enabled LED remains off, see the section "Troubleshooting the Power Subsystems" to check your power connections.

— If power is supplied to the router shelf but the enabled LED remains off, the system has detected a hardware failure. You need to replace the interconnect port adapter.

- Is the link LED on?

  The link LED indicates an active connection to the dial shelf. This LED lights when the dial shelf interconnect port adapter is receiving a carrier signal from the dial shelf.

  — If the link LED remains off, check the dial shelf interconnect cable connection and tighten the jack screws at both ends of the cable.

  — If the connection is good but the link LED remains off, proceed to the section "Troubleshooting the Dial Shelf Controller Card."

Troubleshooting the Dial Shelf Processor Subsystem

The following sections describe troubleshooting procedures for the DSC card, modem cards, VoIP card, and trunk cards.

Troubleshooting the Dial Shelf Controller Card

Check the following to help isolate a problem with the dial shelf controller card:

- Are the two power LEDs on?

  Verify that the power LED and MBus LED light after the dial shelf controller card has been completely inserted into the dial shelf and the system is powered on.

  — If both the MBus and power LEDs are on, the card should boot normally. During the boot sequence, the four alarm LEDs should momentarily flash and then turn off. In addition, the two four-character alphanumeric displays show status messages.

  After the boot sequence completes, the alphanumeric display should read:

  ```
  MSTR
  ```

  If the boot sequence does not finish, contact a service representative for assistance.

  — If either the power or MBus LED remains off, try removing and reinserting the card. If the problem persists, contact your service representative. You might need to replace the card.

  If the problem persists with a new card installed, remove the dial shelf controller card from the dial shelf slot and examine the backplane for bent connector pins.

  To inspect the backplane pins, first power OFF the system to avoid hazards caused by high voltages present on the backplane connectors. Next, remove cards in neighboring slots to allow an unimpeded view of the backplane connectors. Then, using a flashlight, verify that the backplane connectors are in good condition. If you discover bent pins, you need a new backplane. The backplane is an FRU. Contact your service representative to order a new backplane.

- You can also use the **show** command to diagnose a problem with the dial shelf controller card. Enter the following command:

  ```
  router> enable
  enter password <password>
  router# show diag <type {shelf | slot}>
  Ctrl-Z
  ```

Troubleshooting the Dial Shelf Cards

Troubleshooting information for CT1/ET1 or CT3 trunk cards, HMM or DMM modem cards, and the VoIP card is available in the *Cisco AS5800 Universal Access Server Dial Shelf Card Guide* that shipped with your system.

Troubleshooting Network Interfaces

For information about isolating problems with the network connections to your access server, refer to the publication *Troubleshooting Internetworking Systems*, which is available on the Cisco Documentation CD-ROM that shipped with your Cisco AS5800. For more information, see the "Related Documentation" section on page xi.

Cisco AS5800 Specifications

System Specifications

A single Cisco AS5800 consists of a Cisco 5814 dial shelf and a Cisco 7206 router shelf. Table A-1 describes the Cisco 5814 dial shelf specifications, and Table A-2 shows the router shelf network processor card factory-installed DRAM configuration.

For Cisco 7206 router shelf physical specification information, refer to the *Cisco 7206 Installation and Configuration Guide* that shipped with your router shelf.

Table A-1 Cisco 5814 Dial Shelf Specifications

Description	Specification
Dimensions (H x W x D)	28.0 x 17.4 x 23.6 in. (71.1 x 44.2 x 59.9 cm)
Component Weights	
Cisco 5814 dial shelf (with filter module, blower assembly, and 14 cards)	278 lb (126.1 kg)
Cisco 5814 dial shelf (with filter module, blower assembly, and no cards installed)	114 lb (51.7 kg)
Cisco 5814 dial shelf chassis (empty)	62 lb (28.1 kg)
Dial shelf backplane	2.5 lb (1.1 kg)
Dial shelf trunk card	8 lb each (3.6 kg)
Dial shelf modem card	8 lb each (3.6 kg)

Table A-1 Cisco 5814 Dial Shelf Specifications

Description	Specification
Component Weight (continued)	
Dial shelf controller card	8.5 lb each (3.8 kg)
Dial shelf blower assembly	27.5 lb (12.5 kg)
Dial shelf DC power-entry module	8 lb each (3.6 kg)
Dial shelf filter module	5.5 lb (2.5 kg)
AC-input power shelf (empty)	18.5 lb (8.4 kg)
AC-input power supply	14 lb each (6.4 kg)
AC-input power shelf safety cover	3.5 lb (1.6 kg)
Environmental Requirements	
Operational temperature Maximum operating temperature Acceptable temperature rise Maximum heat generated	23 to 104°F (–5° C to 40° C) 23 to 120°F (–5° C to 50° C) (not more than 72 hours) 30°C per hour 8,000 BTU
Backplane	14 slots
Power	44A at –48 VDC
Frequency	50/60 Hz
Heat dissipation	2,000W (6820 Btu/hr)
AC-input voltages and frequency	200 to 240 VAC 50 to 60 Hz
AC voltage and current	200 VAC at 16A maximum[1] wide input with power factor correction (PFC) 240 VAC at 7A maximum
AC cable	12 American Wire Gauge (AWG), with three leads, an IEC-320 receptacle on the power supply end, and a country-dependent plug on the power source end
DC-input voltage and current	–48 VDC to –60 VDC
DC-input cable	6 AWG for North American environments 10 mm^2 wire for international environments when connecting directly to a DC power source
DC voltages supplied and maximum, steady-state current (AC- and DC-input)	–48V, 54A maximum
Relative humidity	
Operating Nonoperating	10 to 90%, noncondensing 10 to 95%, noncondensing
Factory-Installed Memory	
Dial shelf controller card	32-MB DRAM
T1 or E1 trunk card (dial shelf)	32-MB DRAM
Modem card (dial shelf)	16-MB DRAM

Table A-1 Cisco 5814 Dial Shelf Specifications

Description	Specification
Regulatory Compliance	
Agency approvals	Safety: UL 1950, CSA 22.2 No. 950, EN60950, AUSTEL TS001, AS/NZS 3260, IEC 950
	Emissions: CFR 47 Part 15 Class A (FCC), CISPR22 Class B, EN55022 Class B, AS/NRZ 3548 Class B, ICES003, VCCI Class B
	Immunity: IEC 1000-3-2, IEC 1000-3-3, IEC-1000-4-2, IEC-1000-4-3, IEC-1000-4-4, IEC-1000-4-5, IEC-1000-4-6, IEC-1000-4-11, EN50082-1, EN50082-2
	For additional compliance information refer to the *Regulatory Safety and Compliance Information* documents that shipped with your system.

1 Each AC-input power supply requires a minimum of 15A service, with a 15A receptacle at the power source. The power cable supplied with the Cisco AS5800 AC-input power shelf uses a 16A male plug.

Table A-2 Router Shelf Network Processor Card DRAM SIMM Configurations

Total DRAM	DRAM Bank 0	Quantity	DRAM Bank 1	Quantity	Product Number
128 MB	U18 and U25 or U11 and U25	2 32-MB SIMMs	U4 and U12 or U42 and U52	2 32-MB SIMMs	MEM-NPE-128MB

Backplane Specifications

Table A-3 lists the backplane DC power specifications.

Table A-3 Backplane—DC Power Requirements

Description	Specification
Input voltage	
Minimum	–20 (10 ms)
Minimum/Nominal	–38 VDC
Nominal	–48 VDC
Maximum/Nominal	–72 VDC
Maximum	–75 (IS)
Output voltage	
Maximum	–38 VDC
Nominal	–48 VDC
Minimum	–75 VDC
Current	42 A
Minimum (SS)	3 A
Maximum (SS)	60 A
Peak (2 sec)	80 A
Circuit breaker	50 A

Table A-4 lists the backplane environmental specifications.

Table A-4 Backplane—Environmental Specifications

Description	Specification
Dimensions (H x W)	12.75 x 16.75 in. (32.4 x 42.5 cm)
Cooling	Maximum inlet air temperature is 131° F (55° C)
Temperature	
Operating	23 to 131° F (–5 to 55° C)
Nonoperating	–13 to 158° F (–25 to +70° C)
Humidity	
Operating	10 to 90%, noncondensing
Nonoperating	10 to 95%, noncondensing
Altitude	
Operating	9,843 ft (3,000 m) at 104° F (40° C)
Nonoperating	15,000 ft (4,570 m) over allowable temperature range
Thermal shock	
Operating	23 to 113° F (–5 to 45° C at 0.5° C) per minute
Nonoperating	–13 to 158° F (–25 to 70° C) with changeover time between 2 and 3 min
Vibration	
Operating	1.12 g from 3 to 500 Hz
Nonoperating	2 g from 3 to 500 Hz
Ripple and noise	200 mV
Battery feed noise	3 KHz band between 10 KHz and 20 MHz
Voice frequency noise	70 dBrnC
Radio frequency noise	500 mV_{RMS}
Long-term voltage drift	± –0.5%

Blower Assembly Specifications

Table A-5 lists blower assembly DC power requirements.

Table A-5 Blower Assembly—DC Power Requirements

Power	Specification
Voltage to backplane	
Maximum	–38 VDC
Nominal	–48 VDC
Minimum	–75 VDC
Current	
Minimum (SS)	3.0 A
Nominal (SS)	42.0 A
Maximum (SS)	54.0 A
Peak (2 sec)	60.0 A

Table A-6 lists the blower assembly environmental specifications, which are designed to meet NEC, NEBS, and ETSI requirements.

Table A-6 Blower Assembly—Environmental Specifications

Specification	Description
Cooling	Maximum inlet air temperature is 131° F (55° C)
Audible noise	Maximum acoustic noise level is 60 dBa
Temperature	
Operating Nonoperating	23 to 131° F (–5 to 55° C) –13 to 158° F (–25 to 70° C)
Humidity	
Operating Nonoperating	10 to 90%, noncondensing 10 to 95%, noncondensing
Altitude	
Operating Nonoperating	9,843 ft (3,000 m) at 104° F (40° C) 15,000 ft (4,570 m) over allowable temperature range
Thermal shock	
Operating Nonoperating	23 to 113° F at 32.9° F (–5 to 45° C at 0.5° C) per minute –13 to 158° F (–25 to 70° C) with changeover time between 2 and 3 min
Vibration	
Operating Nonoperating	1.12 g from 3 to 500 Hz 2 g from 3 to 500 Hz
Regulatory compliance	ENG-5769 UL 1950 CSA 22.2-950-936 EN 60 950 BABT AUSTEL IEC-801 Telcordia Technologies (formerly Bellcore) NEBS TR-NWT-000063 Telcordia Technologies (formerly Bellcore) NEBS TR-NWT-001089

Dial Shelf Controller Card Specifications

Table A-7 lists dial shelf controller card environmental specifications.

Table A-7 Dial Shelf Controller Card Environmental Specifications

Description	Specification
Cooling	Maximum inlet air temperature is 131° F (55° C)
Temperature	
Operating Nonoperating	23 to 131° F (–5 to 55° C) –13 to 158° F (–25 to 70° C)

Table A-7 Dial Shelf Controller Card Environmental Specifications (continued)

Description	Specification
Humidity	
Operating	10 to 90%, noncondensing
Nonoperating	10 to 95%, noncondensing
Altitude	
Operating	9,843 ft (3,000 m) at 104° F (40° C)
Nonoperating	15,000 ft (4,570 m) over allowable temperature range
Thermal shock	
Operating	23 to 113° F (–5 to 45° C at 0.5° C) per minute
Nonoperating	–13 to 158° F (–25 to 70° C) with change-over time between 2 and 3 minutes
Vibration	
Operating	1.12 Grms from 3 to 500 Hz
Nonoperating	2 Grms from 3 to 500 Hz
Ripple and noise	200 mV
Battery feed noise	3kHz band between 10KHz and 20 MHz
Voice frequency noise	70 dBrnC
Radio frequency noise	500 mV_{RMS}
Long-term voltage drift	± –0.5%

DC PEM Specifications

The PEMs provide –48 VDC power, which is distributed through the filter module to the dial shelf backplane. The analog isolators in the filter module are provided with 15 VDC. The PEMs suffer no damage if any or all outputs have no load (no load occurs when there are no cards plugged into the backplane) or if the maximum input voltage is exceeded; however, input voltages that exceed 75 V eventually trip the PEM 60 A circuit breaker, and you might have to reset the breaker as needed.

Table A-8 lists DC output voltage and current specifications.

Table A-8 Power Entry Module Power Specifications

Power	Description
Voltage to backplane	
Maximum	–38 VDC
Nominal	–48 VDC
Minimum	–75 VDC
Current	
Minimum (SS)	3 A
Nominal (SS)	42 A
Maximum (SS)	54 A
Peak (2 sec)	60 A
Circuit breaker	50A

Table A-9 lists the DC-input power supply environmental specifications, which are designed to meet NEC, NEBS, and ETSI requirements.

Table A-9 Power Entry Module Environmental Specifications

Specification	Description
Cooling	Maximum inlet air temperature is 131° F (55° C)
Temperature	
Operating	23 to 131° F (–5 to 55° C)
Nonoperating	–13 to 158° F (–25 to +70° C)
Humidity	
Operating	10 to 90%, noncondensing
Nonoperating	10 to 95%, noncondensing
Altitude	
Operating	9,843 ft (3,000 m) at 104° F (40° C)
Nonoperating	15,000 ft (4,570 m) over allowable temperature range
Thermal shock	
Operating	23° F to 113° F (–5° C to 45° C) at 0.5° C per minute
Nonoperating	–13° F to 158° F (–25° C to 70° C) with changeover time between 2 and 3 min
Vibration	
Operating	1.12 g from 3 to 500 Hz
Nonoperating	2 g from 3 to 500 Hz
Regulatory compliance	ENG-5769 UL 1950 CSA 22.2-950-95 EN 60 950 ACA TS001, AS3260

Filter Module Specifications

Table A-10 lists the filter module DC power requirements.

Table A-10 Filter—DC Power Requirements

Description	Specification
Input voltage	
Minimum	–20 (10 mS)
Minimum/Nominal	–38 VDC
Nominal	–48 VDC
Maximum/Nominal	–72 VDC
Maximum	–75 (IS)

Table A-10 Filter—DC Power Requirements

Description	Specification
Output voltage	
Maximum	–38 VDC
Nominal	–48 VDC
Minimum	–75 VDC
Current	
Minimum (SS)	3 A
Nominal (SS)	42 A
Maximum (SS)	60 A
Peak (2 sec)	80 A
Circuit breaker	50 A

Table A-11 lists the filter module environmental specifications.

Table A-11 Filter Module Environmental Specifications

Specification	Description
Cooling	Maximum inlet air temperature is 131° F (55° C)
Temperature	
Operating	23° F to 131° F (–5° C to 55° C)
Nonoperating	–13° F to 158° F (–25° C to 70° C)
Humidity	
Operating	10% to 90%, noncondensing
Nonoperating	10% to 95%, noncondensing
Altitude	
Operating	9,843 ft (3,000 m) at 104° F (40° C)
Nonoperating	15,000 ft (4,570 m) over allowable temperature range
Thermal shock	
Operating	23° F to 113° F (–5° C to 45° C at 0.5° C) per minute
Nonoperating	–13° F to 158° F (–25° C to 70° C) with changeover time between 2 and 3 minutes
Vibration	
Operating	1.12 g from 3 to 500 Hz
Nonoperating	2 g from 3 to 500 Hz
Ripple and noise	200 mV
Battery feed noise	3 kHz band between 10 kHz and 20 MHz
Voice frequency noise	70 dBrnC
Radio frequency noise	500 mV_{RMS}
Long-term voltage drift	± –0.5%

Table A-11 Filter Module Environmental Specifications

Specification	Description
Regulatory compliance	ENG-5769 UL 1950 CSA 22.2-950-95 EN 60 950 ACA TS001, AS3260 IEC-801 Telcordia Technologies (formerly Bellcore) NEBS TR-NWT-000063 Telcordia Technologies (formerly Bellcore) NEBS TR-NWT-001089

AC Power Module Specifications

The AC-input power supply operates between 200 and 240 VAC input voltage and supplies –48 VDC to the dial shelf. The AC-input power supply uses a power factor corrector (PFC) that automatically adjusts for the input voltage being supplied.

Table A-12 lists the AC-input power supply specifications.

Table A-12 AC-Input Power Supply—Specifications

Description	Specification
Input	
Input power requirement	2666.66 volt amps VA
Input voltage	200 to 240 VAC
Input frequency	50 to 60 Hz
Power factor	0.90 at 50% of full load; 0.99 at full load
Output	
Power output	2000W with a maximum configuration and one or two AC-input power supplies
Voltage out (V_O) set point:	–48.0 VDC typical. Frame ground strappable to either output terminal.
Current out (I_O) rated:	0 to 41.6A DC; 2000W maximum
Output current limit (steady state)	58.1A DC maximum
Efficiency	88% at full load, 240 VAC, with ORing diode
DC-output stud torque	25 in. lb
Environmental Characteristics	
Dimensions (H x W x D)	5.25 x 17 x 14.4 in. (13.32 x 43.2 x 35.88 cm)
Weight	Per power supply: 14.5 lb (6.6 kg) Empty power shelf: 18 lb (8.16 kg)
Heat dissipation	1037 Btu/hr
AC power cable supplied	12 AWG; 16A[1]
DC interconnect cable supplied	6 AWG, 2 pairs (black and red)

Table A-12 AC-Input Power Supply—Specifications

Description	Specification
Storage temperature	25.8 to 185 °F (–40 to 85 °C)
Operating Temperature (air inlet to power unit)	32 to 122 °F (0 to 50 °C) airflow front to back with 3 clearance for exhaust air in unpressurized enclosure
Acoustics	60 dBA typical; sound pressure level measured at 1 m
Humidity (noncondensing)	5% to 95%
Altitude	–200 to 13,000 ft (-61 to 3,962 m); adjust temperature at –7 °C per 1000 ft. above 8000 ft
Shock and Vibration	Lucent L-533809
ESD	IEC1000-4-2
Reliability (at 40 °C, 200 VAC, 1600 W)	7500 FITS per TR-EOP-000332 1.5 x 10^5 hours MTBF per RIN
Regulatory compliance	
Agency approvals	CE UL CSA VDE For compliance information refer to the *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information* document that shipped with your system.

1 Each AC-input power supply requires a minimum of 15A service, with a 15A receptacle at the power source. The power cable supplied with the Cisco AS5800 AC-input power shelf uses a 16A male plug.

Enhanced Power Supply Specifications

The power supply for the enhanced AC-input power shelf operates between 200 and 240 VAC input voltage and supplies –48 VDC to the dial shelf. The power supply for the enhanced AC-input power shelf uses a power factor corrector (PFC) that automatically adjusts for the input voltage being supplied.

Table A-13 lists the specifications for the enhanced AC-input power shelf AC-input power supply.

Table A-13 Enhanced AC-Input Power Supply Specifications

Description	Specification
Input	
Input power requirement	2666.66 volt amps (VA)
Input voltage	200 to 240 VAC[1]
Input frequency	50 to 60 hertz (Hz)
Power factor	0.90 at 50% of full load; 0.99 at full load

Table A-13 Enhanced AC-Input Power Supply Specifications (continued)

Description	Specification
Output	
Power output	2000W with a maximum configuration and one or two AC-input power supplies
Voltage out (V_O) set point:	–48.0 VDC[2] typical
Current out (I_O) rated:	0 to 41.6 amps DC; 2000W maximum
Output current limit (steady state)	58.1 amps DC maximum
Efficiency	88% at full load, 240 VAC with ORing diode
DC-output stud torque	25 in. lb
Environmental Characteristics	
Dimensions (H x W x D)	5.25 x 17.32 x 13.6 in. (13.32 x 44 x 34.5 cm)
Weight	Per power supply: 11 lb (5 kg) Empty power shelf: 14 lb (6.4 kg)
Heat dissipation	7755 Btu/hr
AC power cable supplied	12 American Wire Gauge (AWG), 16-amp[3]
DC interconnect cable supplied	6 AWG, 2 pairs (black and red)
Storage temperature	25.8 to 185 °F (–40 to 85 °C)
Operating Temperature (air inlet to power unit)	32 to 122 °F (0 to 50 °C) airflow front to back with clearance for exhaust air in unpressurized enclosure
Acoustics	60 dBA typical; sound pressure level measured at 1 m
Humidity (noncondensing)	5 to 95%
Altitude	–200 to 13,000 ft (-61 to 3,962 meters); derate at –7 °C/1000 ft above 8000 ft
Shock and Vibration	Cisco Systems ENG-3396
ESD	IEC1000-4-2
Reliability (at 25 °C, 220 VAC, 2000 W)	150k hours MTBF
Regulatory compliance	
Agency approvals	CE UL CSA VDE For compliance information see the *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information* document that shipped with your system.

1 VAC = volts alternating current.
2 VDC = volts direct current.
3 Each AC-input power supply requires a minimum of 15-amp service, with a 15-amp receptacle at the power source. The power cable supplied with the Cisco AS5800 enhanced AC-input power shelf uses a 16-amp male plug.

Cabling Specifications

This section describes and provides pinout information for the cables available for the Cisco AS5800 that connect to the dial shelf, the router shelf, and power modules and supplies. For pinouts and specifications of cables that connect to dial shelf ingress cards (T1/E1, T3) refer to the *Cisco AS5800 Universal Access Server Dial Shelf Card Guide*.

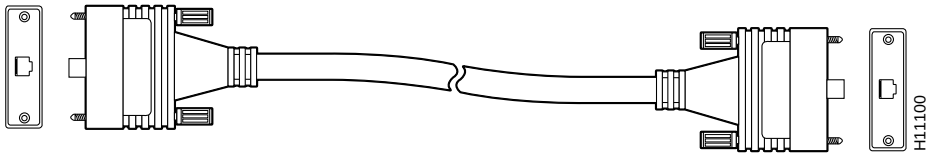
Dial Shelf Interconnect Port Adapter Cables

The dial shelf interconnect port adapter contains a single RJ-45 receptacle, which is used to connect the router shelf to the dial shelf. The cable used for this connection is a Cisco proprietary cable, customized with jackscrews to secure the connection. You must use this specially designed cable, which shipped with your dial shelf interconnect port adapter, to connect the dial shelf to the router shelf.

Caution Disconnecting this cable while the system is operating will result in a loss of all calls.

Figure A-1 shows the dial shelf interconnect cable with jackscrew connectors.

Figure A-1 Dial Shelf Interconnect Cable with Jackscrew Connectors



AC-Input Power Shelf Cables

The AC-input power shelf is equipped with four types of cables:

- Two AC power cords for AC input
- Two DC interconnect cables for DC output
- One DB-25 to DB-9 monitor cable for status signaling
- Two ground cables for grounding the power shelf to the dial shelf

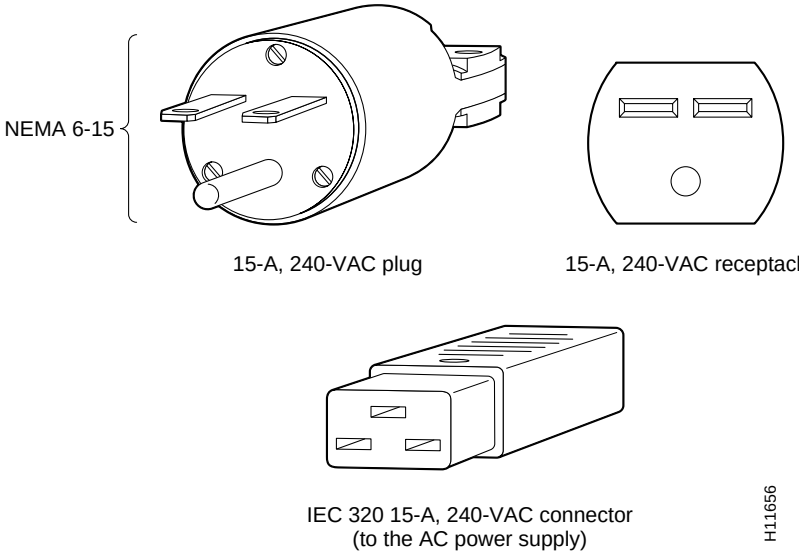
The AC-input connection uses a 15A/240 VAC power cord in Europe, Asia, and North America. The 15A connectors on the AC-input power shelf are incompatible with 15A power strips used in most equipment racks and with the power source used for the router shelf.

Caution Do not plug the AC-input power shelf into the same power source as the AC router shelf.

Note Wiring codes prevent the AC-input power cable from being used with the power strips in equipment racks.

Figure A-2 shows 15-A North American power connectors.

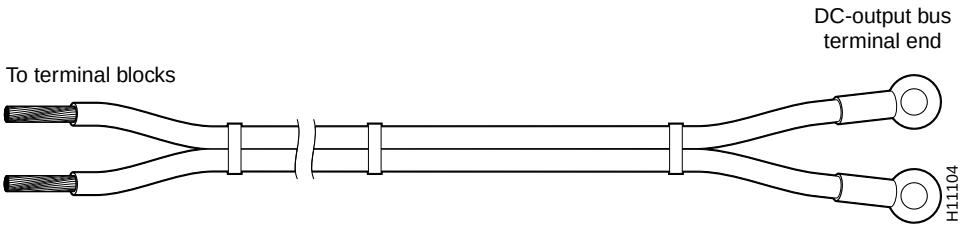
Figure A-2 15-Amp AC Power Cord Connector and Plug, and 15-Amp Receptacle



The European or Asian power cable is rated at 16A/250-VAC. The source-side power cable connector is either shipped to match local compliance, or wired at the installation site.

The DC interconnect cables (see Figure A-3) supplied with your AC-input power shelf attach to bus terminal studs in the AC-input power shelf using ring-lug connectors; the cables then connect to the DC terminal blocks in each PEM.

Figure A-3 DC Interconnect Cables



The monitor cable has a DB-25 connector on the AC-input power shelf end and a DB-9 connector on the dial shelf end that connects to the dial shelf filter module. Figure A-4 shows the monitor cable connectors and receptacles. The pinout of the monitor cable varies slightly between the standard and enhanced AC power shelves.

Figure A-4 Monitor Cable

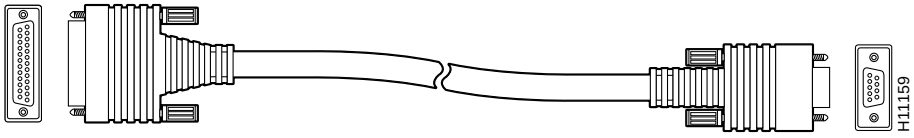


Table A-14 describes the cable pinout used with the AC power shelf.

Table A-14 Monitor Cable Pinout —AC Power Shelf

DB-9 Pin	Signal Description	DB-25 Pin[1]
1	AC power failure warning signal	11
2	AC power shelf overtemperature signal	10
3	AC power shelf fault signal	9
4	Ground	8
6	Ground	13
7	Ground	19
8	Ground	19
9	AC power shelf missing module	12

1 DB-25 pins not listed are not used.

Industry-Standard Wiring Plans

When you order multiple internetwork systems, you face the problem of organized wiring. In response to this problem, AT&T has devised a uniform wiring scheme for the telephone industry. The wiring scheme uses two color codes—one for a large number of wires that are organized into pairs, and one for a smaller number of wires that might also be organized into pairs. We recommend the use of this wiring scheme whenever possible.

For large numbers of wires, each pair is assigned a two-color code. The colors are selected from 2 groups of 5, resulting in what is called a *binder-group* of 25 pairs. The colors used for a group are white, red, black, yellow, and violet. The colors used for "pair within group" are blue, orange, green, brown, and slate.

Each pair must have a unique color combination. One wire within each pair has a solid background of its group color and stripes of the "pair within group" color; the second wire has the colors reversed. Table B-1 lists the sequences. Note that red-brown and red-orange wires can be easily confused.

Table B-1 Telephone Industry 25-Pair Color Code and Pin Numbers

Pair Number	Wire Number	Solid Color	Stripe Color	Pin Number
1	1	White	Blue	26
1	2	Blue	White	1
2	1	White	Orange	27
2	2	Orange	White	2
3	1	White	Green	28
3	2	Green	White	3
4	1	White	Brown	29
4	2	Brown	White	4
5	1	White	Slate	30
5	2	Slate	White	5
6	1	Red	Blue	31
6	2	Blue	Red	6
7	1	Red	Orange	32
7	2	Orange	Red	7
8	1	Red	Green	33
8	2	Green	Red	8

Table B-1 Telephone Industry 25-Pair Color Code and Pin Numbers (continued)

Pair Number	Wire Number	Solid Color	Stripe Color	Pin Number
9	1	Red	Brown	34
9	2	Brown	Red	9
10	1	Red	Slate	35
10	2	Slate	Red	10
11	1	Black	Blue	36
11	2	Blue	Black	11
12	1	Black	Orange	37
12	2	Orange	Black	12
13	1	Black	Green	38
13	2	Green	Black	13
14	1	Black	Brown	39
14	2	Brown	Black	14
15	1	Black	Slate	40
15	2	Slate	Black	15
16	1	Yellow	Blue	41
16	2	Blue	Yellow	16
17	1	Yellow	Orange	42
17	2	Orange	Yellow	17
18	1	Yellow	Green	43
18	2	Green	Yellow	18
19	1	Yellow	Brown	44
19	2	Brown	Yellow	19
20	1	Yellow	Slate	45
20	2	Slate	Yellow	20
21	1	Violet	Blue	46
21	2	Blue	Violet	21
22	1	Violet	Orange	47
22	2	Orange	Violet	22
23	1	Violet	Green	48
23	2	Green	Violet	23
24	1	Violet	Brown	49
24	2	Brown	Violet	24
25	1	Violet	Slate	50
25	2	Slate	Violet	25

Cables with more than 25 pairs of wires are constructed from 25-pair groups. Very large cables have other variations generally not encountered inside terminal wire plants.

For smaller numbers of wires, such as wires for an individual telephone station or terminal, you may use a second color-code scheme. Table B-2 lists this color code and the usual correspondence with the paired-wire color code. The alternate color code is included because sometimes the station wire uses the first three pairs from the standard color code (white-blue, blue-white, and so on), while at other times it uses the six alternate colored wires.

Table B-2 Second Color-Code Scheme for Smaller Numbers of Wires

Pair Number	Wire Number	Solid Color	Stripe Color	Alternate Color	Pin Number
1	1	White	Blue	Green	4
1	2	Blue	White	Red	3
2	1	White	Orange	Black	2
2	2	Orange	White	Yellow	5
3	1	White	Green	White	1
3	2	Green	White	Blue	6

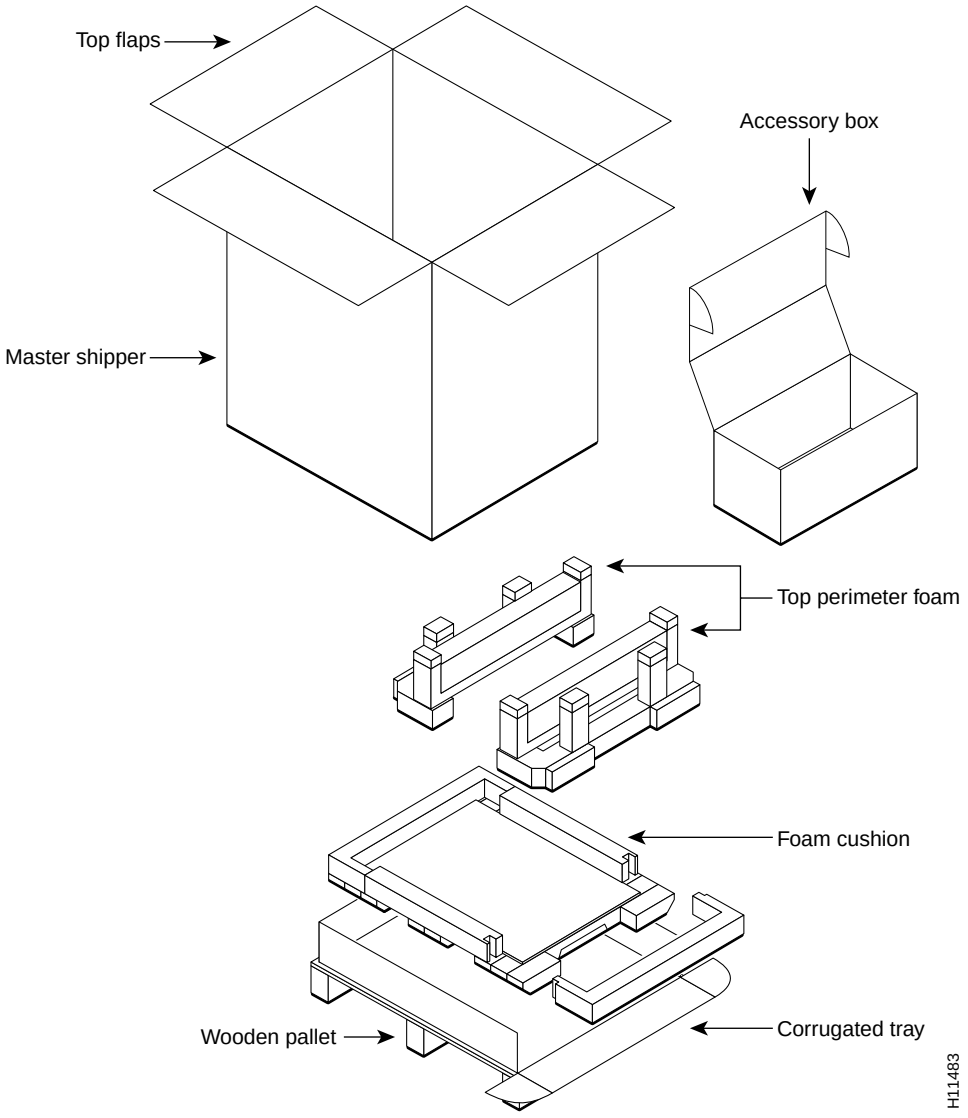
Cisco 5814 Dial Shelf Packaging Replacement Instructions

This appendix provides packaging material information for the Cisco 5814 dial shelf. It explains how to prepare the dial shelf for repackaging and how to package the dial shelf for shipping. This appendix assumes that you are returning your entire Cisco 5814 dial shelf. If you are returning an empty chassis, use these instructions as applicable.

The Cisco 5814 dial shelf is a large, heavy chassis; it measures 19-in. (48.3 cm) wide, 21-in. (53.3 cm) deep, and 56-in. (142.2 cm) high. A fully configured dial shelf weighs approximately 278 lb (126.1 kg). In order to ship the chassis safely, a packaging kit has been engineered to prevent shock damage. This is the same packaging kit originally used to ship the dial shelf. If your original system packaging is damaged or was discarded, you must order a replacement packaging kit (PKG-5814=).

Figure C-1 shows the dial shelf packaging detail.

Figure C-1 Cisco 5814 Packaging Detail



Required Tools and Parts

You will need the following tools and parts to remove the Cisco 5814 dial shelf components and to repackage the Cisco 5814 dial shelf:

- Your own ESD-preventive wrist strap
- Cable ties (recommended, but not essential)
- An antistatic mat
- No. 2 Phillips screwdriver
- 1/4-in. flat-blade screwdriver
- Standard strapping tool and strap or banding material
- Cisco 5814 repackaging kit (PKG-5814=), which includes:
  - Wooden pallet and base tray assembly (corrugated tray, foam cushions, corrugated chassis platform
  - Plastic bag
  - Top perimeter foam
  - Accessory box
  - Master shipper

Powering Off the Cisco AS5800

You must power off the Cisco AS5800 before attempting to dismantle the dial shelf for repackaging.

Powering off the access server involves the following components:

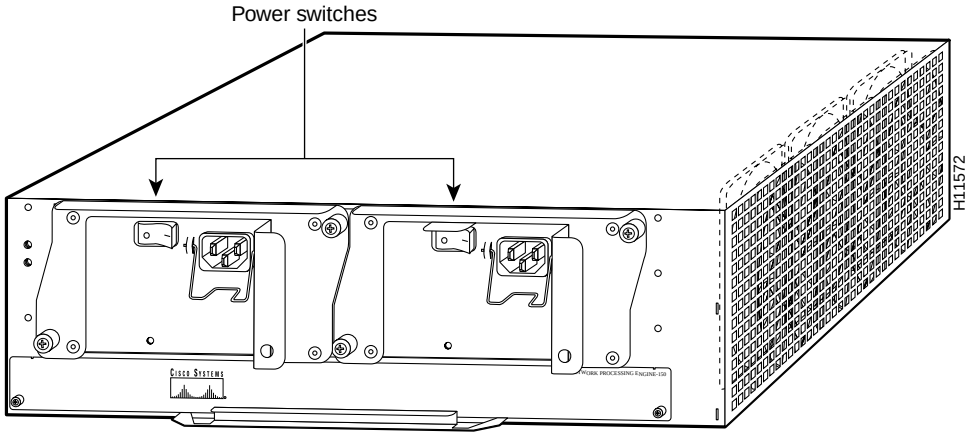
- Router shelf
- Dial shelf
- AC-input power shelf, if applicable

To power off the Cisco AS5800, follow these steps:

Warning Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

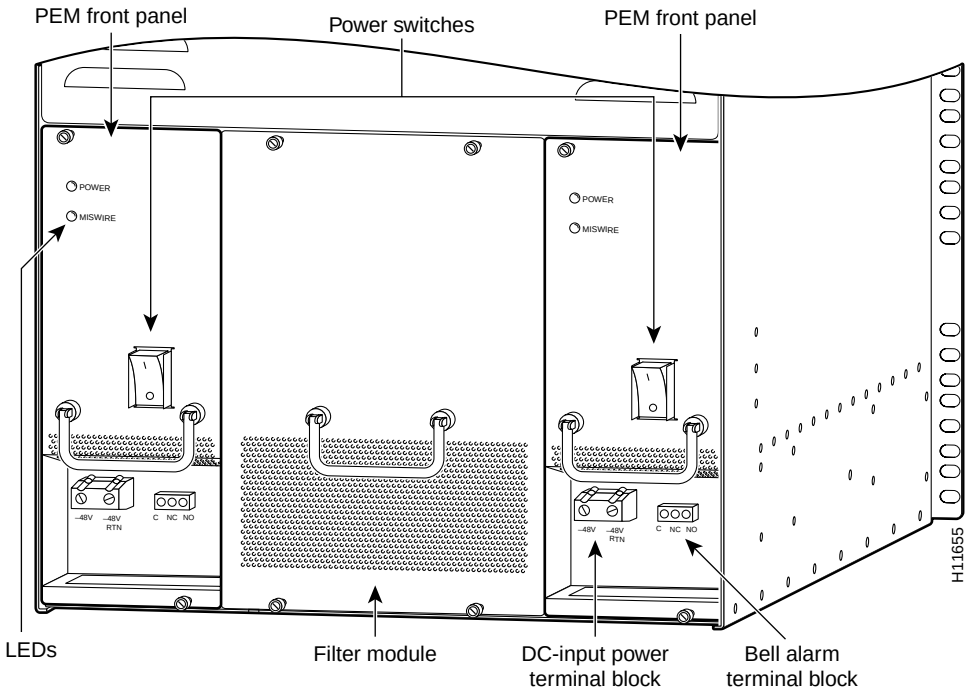
Step 1 Power OFF (O) the power switches located on the router shelf rear panel. (See Figure C-2.)

Figure C-2 Router Shelf Power Switches



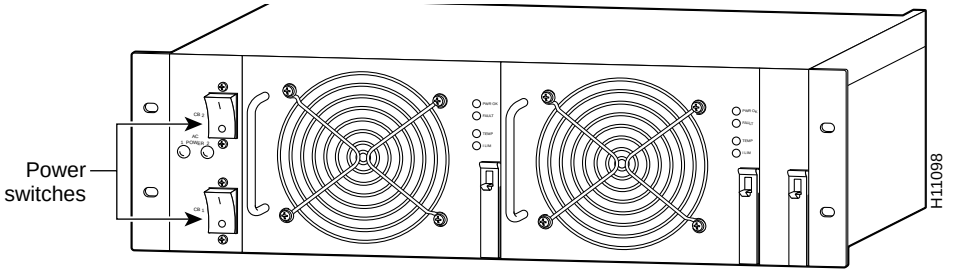
Step 2 Power OFF (O) the power switches located on each dial shelf PEM front panel. (See Figure C-3.)

Figure C-3 Dial Shelf Power Switches on the PEMS



Step 3 If you are using the optional AC-input power shelf, power OFF (O) the power switches located on the AC-input power shelf front panel. (See Figure C-4.)

Figure C-4 AC-Input Power Shelf

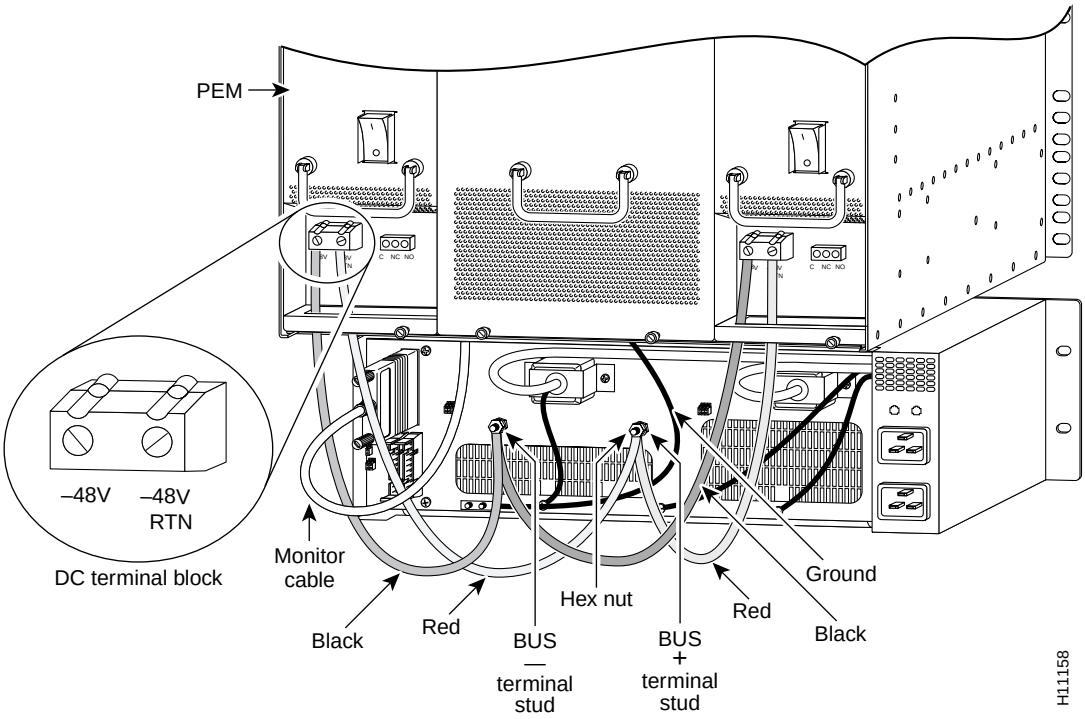


Step 4 Power OFF the central office main circuit breaker.

Caution If you are using the optional AC-input power shelf, you must power off both AC-input power supplies before you disconnect the DC cables from the DC terminal blocks.

Step 5 Loosen the screws in the DC-input power terminal blocks and the alarm terminal blocks using a 1/4-in. flat-blade screwdriver, and disconnect power cables and alarm cables to the dial shelf PEMs. Figure C-5 shows the location of the terminal blocks.

Figure C-5 PEM DC Terminal Block

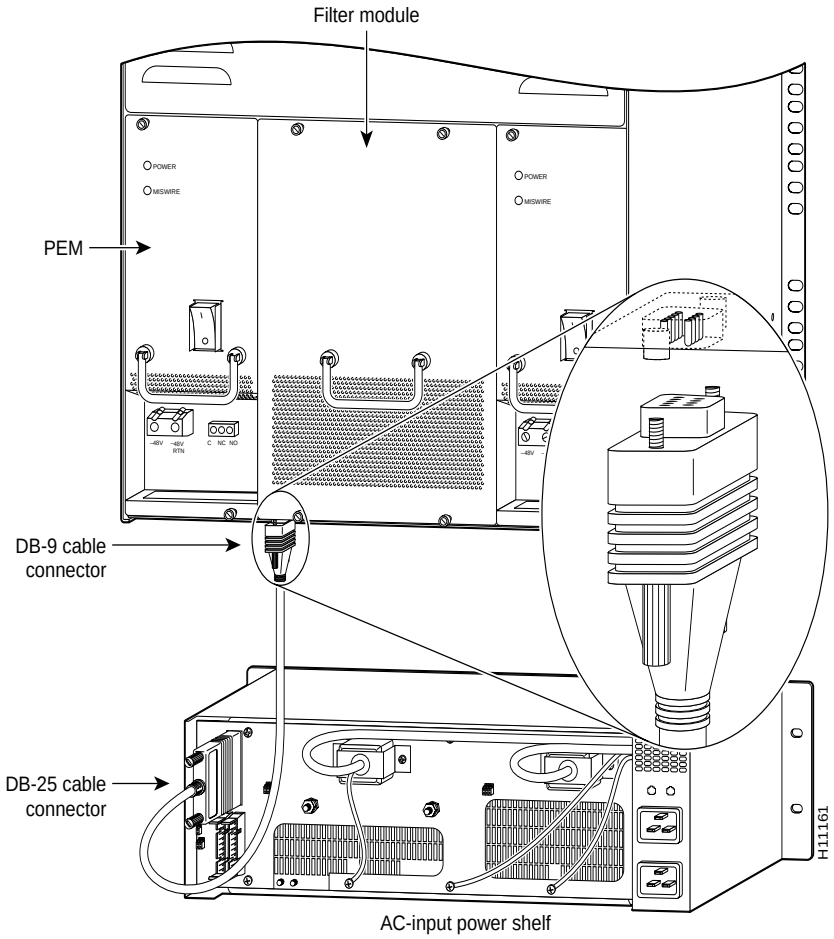


Step 6 Disconnect the DC power cables from your DC power source.

The last two steps refer to the optional AC-input power shelf. If you are using a DC power source, you can skip Step 7 and Step 8 and proceed to the section “Preparing to Repackage the Cisco 5814 Dial Shelf.”

Step 7 Disconnect the monitor cable DB-9 connector from the base of the filter module. (See Figure C-6.)

Figure C-6 Filter Module Monitor Cable DB-9 Connector



Step 8 Disconnect power cables to the optional AC-input power shelf. (See Figure C-7.)

Figure C-7 AC-Input Power Shelf Cable Connections

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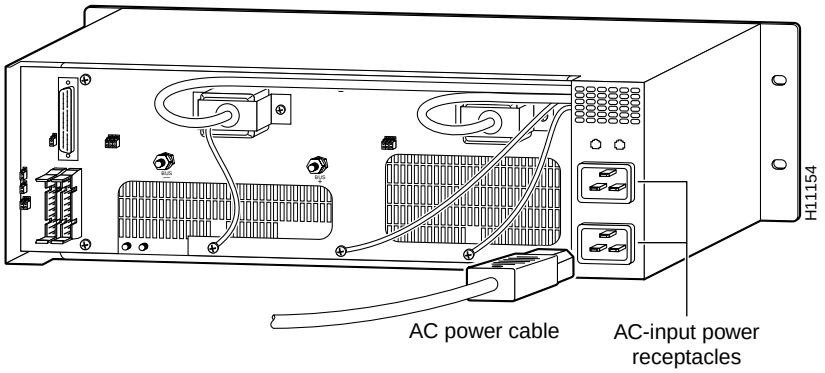

Step 9 Disconnect incoming CE1 or CT1 trunk line cables and secure them out of the way using cable ties, if necessary. On the dial shelf controller card, disconnect the dial shelf interconnect cable and the BNC connection if applicable.

This completes the power-off sequence. Proceed to the following section, "Preparing to Repackage the Cisco 5814 Dial Shelf."

Preparing to Repackage the Cisco 5814 Dial Shelf

The Cisco 5814 dial shelf is equipped with a blower assembly, dial shelf cards (trunk and modem cards) and dial shelf controller cards configured in the chassis. Fully loaded, the dial shelf weighs 278 lb (126.1 kg).

Before removing the Cisco 5814 from the rack, we recommend that you remove the dial shelf cards, dial shelf controller cards, and the blower assembly from the dial shelf to decrease the chassis weight (see the "Removing the Blower Assembly" section on page 2-6 and the "Removing Dial Shelf Cards and Dial Shelf Controller Cards" section on page 2-9), then reinstall the components (See the "Replacing the Dial Shelf Components" section on page 3-10) after the dial shelf is seated on the shipping pallet/base tray assembly.

Repackaging the Cisco 5814 Dial Shelf

To repackage the Cisco 5814 dial shelf, follow these steps:

Step 1 Lay the opened plastic bag, with sides rolled down, on the pallet/base tray assembly. (See Figure C-1.)

Step 2 Remove the screws securing the rear mounting brackets on the dial shelf to the rear rack posts. Next, remove the rear brackets from the dial shelf chassis.

Caution If the dial shelf is suspended in the rack, install the two support brackets that were included in your original rack-mount kit under the chassis to prevent it from falling while you are removing the rack-mount screws and brackets.

Step 3 Remove the screws securing the front of the dial shelf chassis to the rack.

Step 4 Lift and slide the chassis out of the rack.

Warning Two people are required to lift the chassis. Use the handles on the chassis sides. To prevent injury, keep your back straight and lift with your legs, not your back. To prevent damage to the chassis and components, never attempt to lift the chassis with the handles on the power supplies, the filter module, or on the blower assembly. These handles are not designed to support the weight of the chassis. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Step 5 Seat the dial shelf on the pallet/base tray assembly, and remove the front rack-mount brackets from the chassis sides, if applicable.

Step 6 Place all accessories (including power cords, cables, documentation, and mounting hardware) in the accessories box and tape the box closed.

Step 7 Replace the blower assembly, dial shelf cards, and dial shelf controller cards you removed into the dial shelf chassis.

Step 8 Pull the sides of the plastic bag up over the dial shelf chassis and seal the bag.

Step 9 Position the foam around the top chassis perimeter.

Step 10 Place the accessories box on top of the dial shelf chassis.

Step 11 Slide the master shipper over the top of the chassis and base tray; close the top flaps and seal with tape. (See Figure C-1.)

Step 12 Secure the container to the pallet and base tray using a standard strapping tool and banding.

The Cisco 5814 dial shelf is now packaged and ready to be transported. Use a forklift or pallet jack to move the dial shelf container.

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